



# Future of Creative Technologies

Journal of the Institute of  
Creative Technologies

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## About the IOCT

The IOCT was launched in Autumn 2006 at De Montfort University to conduct transdisciplinary research at the nexus of the arts, humanities, science and technologies. Our research themes focus upon enhancing quality of life and understanding cultural horizons.

For information about the IOCT and our projects, visit [ioct.dmu.ac.uk](http://ioct.dmu.ac.uk)

If you would like to contribute to future issues of this publication, please contact Dr Tracy Harwood ([tharwood@dmu.ac.uk](mailto:tharwood@dmu.ac.uk)) in the first instance.

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## Editors' Comments

Welcome to the first issue of the Future of Creative Technologies, anew bi-annual transdisciplinary publication by the Institute of Creative Technologies (IOCT) at De Montfort University. This issue of the journal presents an eclectic mix of six thought pieces and articles by keynote speakers hosted by the IOCT in its first 18 months of existence, selected by the editors.

The diversity of the content is deliberate, and is intended to stimulate readers not only from the range of disciplines represented herein, but also as a way of exploring further a discussion which lies at the heart of the IOCT: what does it mean to be transdisciplinary? how can we foster good practice in transdisciplinary research? and, what outcomes might we expect from such research?

Reflecting upon our ambitions to be an institute which conducts research at the nexus of the arts, humanities, sciences and technologies, we acknowledge that to be transdisciplinary can sometimes appear to be in conflict with traditional approaches to research within Higher Education in the UK today. However, this publication clearly demonstrates that transdisciplinarity is central to creativity and the ways in which people interact with technology now and in the future. The boundaries between research disciplines appear to be dissolving before our eyes.

'Creative technologies' does not exist as an academic discipline in its own right – and it is not our intention to create such a discipline, but we do attempt to illustrate through the pages of this publication, and its future issues, that quality outputs can be achieved through extreme collaborations. Whilst this issue of the journal adopts a traditional, text-based publication format, including online ([www.ioct.dmu.ac.uk/publications](http://www.ioct.dmu.ac.uk/publications)), future issues are expected to include other media!

In this issue, the first thought piece is by IOCT Visiting Professor, **Howard Rheingold**, World renowned for his contributions to the field of social networking, and his books, *Smart Mobs* and *The Virtual Community*. Rheingold has been a regular visitor to the IOCT and has spoken on more than one occasion. Here he touches on fields of sociology, anthropology, education and technology in *Understanding and Extending Human Sociality: Literacies, Transliteracies and 21st Century Pedagogy*. Through his comments, we come to understand the enormous contribution the internet has made to human social practices and examine what 'cyberculture' might mean in the future. Rheingold argues that in doing complicated things together, people create significant common value and that collective action possible only through virtual communities empowers us even further. Such empowerment, underpinned by shared literacies, can create wealth, alleviate suffering and invent new institutions, but this may come at a price. Rheingold postulates the need for people to know how to participate in the 'infosphere'.

**Claudia Eckert's** keynote contributed to the IOCT's discussion on 'What is Creativity?', a series of Arts and Humanities Research Council (AHRC) funded seminars and conference organised by Stephen Brown, Professor of Digital Media and Director of Knowledge Media Design within the Faculty of Art and Design at De Montfort University. In *Design Processes and the Rhetoric of Creativity*, Eckert uses the Department of

Trade and Industry's definitions of creativity as a thought process, design as an articulation of creativity and innovation as an output of the process to question the wisdom of separating technical design domains from artistic ones. She argues that creativity and creative production should be seen as a continuum because they are necessarily the result of collaboration between artistic and technical talents. Using psychology, engineering, design and operations management, Eckert examines the extent of tacitness and embeddedness of creativity in individuals and suggests that it is the scale of a task at hand that establishes the rhetoric around it. She identifies that a 'structure' to the creative process may assure quality and, ultimately, delivery of products as well as mitigate for risk of failure, typically in a market context.

**Bruce Mason** and **Sue Thomas**, respectively a Post Doctoral Research Fellow of the IOCT and Professor of New Media in the Faculty of Humanities, De Montfort University, have similarly contributed much to discussions within the IOCT. Their paper, *A Million Penguins: An Analysis*, describes their evaluation of a 1000+ page wiki-novel experiment by De Montfort University and Penguin Books, involving some 1,476 authors, that took place in 2007. The wiki-novel was viewed by more than 75,000 people during its 'live writing' phase and attracted the attention of mainstream Media, literary commentators and authors around the World. Mason and Thomas' analysis uses the idea of transliteracy, underpinned by sociology, media theories and technology, to critique "A Million Penguins". The experiment aimed to establish whether a community could write a novel but is significant in that it identifies the core components of such a community of writers, or 'crowd', and the social patterns that result not in a mass collaborative work, but rather a virtual 'carnival'; trolls, gardeners, gnomes, performers and all. This paper is a shortened analysis – a full report of the experiment can be found on the IOCT's website (see [www.ioct.dmu.ac.uk/projects/amillionpenguinsreport.pdf](http://www.ioct.dmu.ac.uk/projects/amillionpenguinsreport.pdf)).

**Wendy Keay-Bright** is a Reader in Inclusive Design at the University of Wales Institute Cardiff's School of Art and Design and has presented her research at the IOCT. She is working with us to further develop Reactickles. Keay-Bright presents her ongoing award winning NESTA funded research in the paper *The Reactive Colours Project: Taking an Embodied Approach to Information Communication Technologies, Creativity and Special Education*. The paper, underpinned by theories of education, psychology and technology, explains how playfulness using technologies and art can be used to promote social interaction, creativity and learning among children with the most severe Autism Spectrum Disorders (ASDs). Keay-Bright reviews the project's suite of software applications and describes how the modalities of different technologies contribute to the user experience, positively impacting on sensory stimulation and reflection as well as the pre-requisites for communication, such as waiting and turn-taking. The next phase of the research is also explained, whereby the project team will seek to develop the inherent connectivity of mobile and other interactive technological devices into a 'generative map' of user art, which will further expand participation in the project.

In *The Expanded Instrument System (EIS): An Introduction and Brief History*, **Pauline Oliveros**, an acclaimed composer, performer, researcher and educator of digital music, evaluates

a creative technology that she has worked with for over 40 years. Oliveros has been an important part of the IOCT's ongoing research in music technologies and digital performance, and her recent visit to the University generated much interest among a wide audience. The IOCT's Internet Orchestra works with her Telematics Ensemble, and future performances at Rensselaer Polytechnic Institute's new experimental media and performing arts centre are in preparation. Oliveros' article presents an intriguing and technical overview of an evolving system, a 'time/space machine' that supports and enhances improvisation in musical performance. Originally based on her early experiences with tape delay, the EIS remains a work in progress, and as well as providing a brief review of its history, Oliveros suggests how the next stages of its development will be informed by artificial intelligence, creating a system that learns from experience.

The final article in this issue is by **Martin Rieser**, recently jointly appointed Professor of Digital Creativity between the IOCT and the Faculty of Art and Design at De Montfort University. Rieser's article, *Mobile, Pervasive and Locative Media Art and the Reinvention of Place*, is a fascinating account of the rise of technologies and their deep embeddedness into modern life, drawing on theories of sociology, psychology, architecture, geography, media and art. Rieser suggests mobile technologies, and 'dispersed' modes of interaction with them, have led to the emergence of new types of art, albeit these are in early stages of development and various phases of understanding by researchers, artists, politicians, marketers and consumers alike. He describes new forms of mapping of the World which are largely conceptual in nature and a 'geospatial web' of urban space which relies on mass, or collective, construction, action, reaction and interaction.

The IOCT has identified two broad research themes to date: Quality of Life, and Cultural Horizons. Within both of these is implied an analysis of the present and a contemplation of the future. This cuts across all the papers in this issue. Thus Keay-Bright's contribution concerns itself explicitly with improving quality of life for autistic children, but in so doing sees new cultural horizons, whereas Oliveros' paper begins by expanding our cultural horizons with regard to an area of music practice, which leads directly to the kind of 'quality of life' concerns that characterise all the activities of her Deep Listening Institute. Similar generalised comments may be made about all the papers, but there are also some specific commonalities that emerge, particularly with regard to **modalities, interactivity** and the **digital culture**.

The **modality** of creative technologies refers not just to the way in which technology is engineered (is this why so much equipment has a button marked 'mode'?), nor even to the ways in which humans use technologies (so much creativity derives from an intentional *misuse* of technology) but, crucially, to the combinations of factors (timings, meanings, ontologies, etc) that form the qualities of the relationship between human and tool. This is present as a theme throughout the articles, from Eckert's design engineering to Rieser's technological embeddedness.

**Interactivity** is a familiar but loaded term, much derided for its inadequacies when describing some of the more under-developed aspects of digital media. Yet its pervasiveness, both

as a concept and a practice, is so complete as to make it an implicit theme in most of the papers. As Mark Weiser once remarked in an influential article "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (Weiser, 1991). Each of the technologies described in this issue has the capacity to achieve that kind of disappearance, and to enable human-to-human interactivity in ways which enhance creativity. Some are already well on the way to doing so, such as Rheingold's transliterate devices and the wiki described by Mason and Thomas, a 'tool' which has now become a byword for collaborative interactive construction.

Such interactivity characterises the **digital culture**, which is advancing so rapidly as to approach a post-digital state in which the fact of a technology being digital is as unremarkable as the fact that, say, it is coloured green. When we drive a car or operate a fridge or make a phone call, we are, in effect, programming computers. Yet very few people would bother to think about it that way because those activities are so familiar. To the 'born digital' generation (post c.1993), the very phrase 'digital culture' will seem as absurd by virtue of its obviousness as it seems anomalous by virtue of its freakishness today. And yet, the change to a digital culture has affected everything rapidly and profoundly, from the role of commerce to the appreciation of art. The articles in this issue simultaneously exemplify and meditate upon this profound change, which has implications for both present and future.

We encourage you to read ALL of the articles contained in this issue – and hope you enjoy the challenge this presents as much as we have enjoyed listening to the keynotes at the IOCT and assembling this issue of the Future of Creative Technologies. We look forward to your participation in this discussion and welcome your feedback to this issue – please do post comments on our discussion board or email.

If you would like to contribute to a future issue, please contact Tracy Harwood in the first instance.

Regards,

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## Understanding and Extending Human Sociality: Literacies, Transliteracies and 21st Century Pedagogy

Howard Rheingold

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The focus of my interest has expanded from considerations of technologies and their social impacts to the literacies certain technologies sometimes enable.

Literacies are where technologies meet the part of human nature that invents increasingly complex social activity - arrangements for exchanging information and knowledge, forging relationships, creating groups, organizing collective action. When I refer to technologies, I do not limit the term to the tangible artifacts such as computers and printing presses, but include such tools as language, typefonts, norms such as netiquette - the meta-tools, social practices and methodologies that grow up around certain tools and amplify their usefulness.

Literacies - their powers, dangers, adoption or rejection by different groups -- are deeply tied to narrative. I believe, as I noted in my first lecture at the Institute of Creative Technologies, that humans are in the midst of a transition that begins with a change in the narrative that many people internalize and disseminate - the story about why we are social. The current narrative could be titled "Radical Self Interest". I believe that what we are witnessing with the rise of many to many media and digitally networked publics is the emergence of a scaffolding for what could be called "Deep Self Interest".

People do things together for a rich mixture of reasons. The current story that most of us tell ourselves about how humans get things done is focused on the well-known flavours of self-interest that make for great drama - survival, power, wealth, sex, glory. People also do things together for fun, for the love of a challenge, and because we are smart enough to want to work together from time to time to make something beneficial to everybody. If I had to reduce the essence of Homo sapiens to five words, "people do complicated things together" would do. Agriculture, specialization, education, slavery, commerce, democracy, organized warfare, benevolent societies, universities, and lynch mobs are examples.

Online social networks can be powerful amplifiers of collective action precisely because they augment and extend the power of this ever-complexifying human sociality that predated and was a necessary precursor to technology. To be sure, gossip, conflict, slander, fraud, greed, hatred and bigotry are part of human sociality, and those parts of human behaviour can be amplified, too, by literacies. But altruism, fun, community and curiosity are also essential parts of human sociality - and I propose that the Web is an existence proof that these capabilities can be amplified, as well.

Indeed, our species' social inventiveness appears to be central to what it is to be human. The parts of the human brain that evolved most recently, and which are connected to what we consider to be our "higher" faculties of reason and forethought, are also essential to social life - the neural information-processing required for recognizing people, remembering their reputations, learning the rituals that remove boundaries of mistrust and bind groups together, from bands to communities to civilizations, may have been enabled by (and may have driven the rapid evolution of) that uniquely human brain structure, the neocortex[1].

My experiences of life online, particularly the longer-term discussions that I came to call "virtual communities," led to and preceded my thinking about the impact of technologies or literacies. [2] The fun of talking, planning, debating, helping each other online came before the notion that our tiny subculture might grow into a worldwide, many-to-many, multimedia network of a billion people. We started to dream about future cybersocial possibilities only after personally experiencing something new, moving, and authentic in our webs of budding friendship and collaboration. In recent years, cyberculture studies has grown into a discipline-more properly, an interdisciplinary involving sociologists, anthropologists, historians, psychologists, economists and political scientists.[3] Back when people online argued in 1200 baud text about whether one could properly call what we were doing a form of community, there was no body of empirical evidence to serve as a foundation for scientific argument -ALL theory was

anecdotal. By now, however, there is plenty of data. One particularly useful affordance of online sociality is that a great deal of public behaviour is recorded and structured in a way that makes it suitable for systematic study. One effect of the digital Panopticon is the loss of privacy and the threat of tyrannical social control; another effect is a rich body of data about online behaviour. Every one of Wikipedia's millions of edits, and all the discussion and talk pages associated with those edits, for example, is available for inspection -- along with billions of Usenet messages. The history of open source software, a modern paradigm of the kind of collaboration Yochai Benkler has named "social production", is digitally inscribed in online mail archives and other virtual but recorded fora.[4] Scientists are beginning to turn their lenses on this inscribed behaviour. We're beginning to know something about what works and what doesn't work with people online, and why.

Does knowing something about the way technical architecture influences behaviour mean that we can put that knowledge to use? Now that we are beginning to learn a little about the specific sociotechnical affordances of online social networks, is it possible to derive a normative design? How should designers think about the principles of beneficial social software? I believe that these questions are directly connected to the kinds of questions that Plato and Aristotle asked in regard to how societies should be governed. The design of social software is always political, whether or not the designers are aware or mindful of the power dimensions of their creations. In the digital realm, one democracy's technology of freedom is another tyranny's technology of control - the way so many people live our lives online and leave traces of our behaviour behind, for example. This describes the fundamental enabling technology of Wikipedia. It also describes the foundation for a surveillance society.

Can inhumane or dehumanizing effects of digital socializing be mitigated or eliminated by better media design? Or is the issue strictly a political issue of who has the power to control the use of media? In what ways does the design of social media enable or prevent heartfelt communitas, organized collective action, social capital, cultural and economic production? In what ways does design matter less than political control?

I've continued to make a direct experience of my life online because online media made it possible to connect with people who shared my interests, even if I had never heard of them before, even if they lived on the other side of the world. But in parallel with my direct experience of the blogosphere, vlogosphere, twitterverse and other realms of digital discourse, I've continued to track new research and theory about what cyberculture might mean, and the ways in which online communication media influence and are shaped by social forces.

One of the first questions that arose from my earliest experiences online was the question of why people in online communities should spend so much time answering each other's questions, solving each other's problems, without financial compensation. I first encountered Yochai Benkler in pursuit of my curiosity about the reason people would work together with strangers, without pay, to create something nobody owns -- free and open source software. First in Coase's Penguin [5], and then in The Wealth of Networks [4], Benkler contributed to important theoretical foundations for a new way of thinking about online activity-"commons based peer production," technically made possible by a billion PCs and Internet connections-is a new form of organizing economic production, together with the market and the firm.

If Benkler is right, the new story about how humans get things done includes an important corollary - if tools like the PC and the Internet make it easy enough, people are willing to work together for non-market incentives to create software, encyclopedias and archives of public domain literature. While the old story [6] is that people are highly unlikely to cooperate with strangers to voluntarily create public goods, the new story seems to be that people will indeed create significant common value voluntarily, if it is easy enough for anybody to add what they want, whenever they want to add it ("self election"). There is plenty of evidence to support the hypothesis that what used to be considered altruism is now a byproduct of daily life online. So much of what we take for granted as part of daily life online, from the BIND software that makes domain names work, to the Apache webserver that powers a sizable chunk of the world's websites, to the cheap Linux servers that Google stacks into its global datacloud, was created by volunteers who gave their creations away to make something larger possible-the Web as we know it. [7]

To some degree, the explosion of creativity that followed the introduction of the Web in 1993 was made possible by deliberate design decisions on the part of the Internet's architects, the end-to-end principle, built into the

TCP/IP protocols that make the Internet possible, deliberately decentralizes the power to innovate, to build something new and even more powerful on what already exists. Is it possible to understand exactly what it is about the web that makes Wikipedia, Linux, fightaids@home, the Gutenberg Project and Creative Commons possible? And if so, can this theoretical knowledge be put to practical use?

I believe that the way to do this attention-turning is by developing a participative pedagogy, assisted by digital media and networked publics, that focuses on catalyzing, inspiring, nourishing, facilitating, and guiding literacies essential to individual and collective life in the 21st century. Literacies are where human brains, human sociality, and communication technologies can work together. We're accustomed to thinking about the tangible parts of communication media-the devices and networks-but the less visible social practices and social affordances, from the alphabet to TCP/IP, are where human social genius can meet the augmenting power of technological networks. Literacy is the most important method Homo sapiens has used to introduce systems and tools to other humans, to train each other to partake of and contribute to culture, and to humanize the use of instruments that might otherwise enable commodification, mechanization and dehumanization.

By literacy, I mean, following on Neil Postman and others, the set of skills that enable individuals to encode and decode knowledge and power via speech, writing, printing, collective action, and which, when learned, introduce the individual to a community. Literacy links technology and sociality. The alphabet did not cause the Roman Empire, but made it possible. Printing did not cause democracy or science, but literate populations, enabled by the printing press, devised systems for citizen governance and collective knowledge creation. The Internet did not cause open source production, Wikipedia, or emergent collective responses to natural disasters, but it made it possible for people to act together in new ways, with people they weren't able to organize action with before, in places and at paces for which collective action was not possible before. Literacies are the prerequisite for the human agency that used alphabets, presses, and digital networks to create wealth, alleviate suffering, and invent new institutions.

If the humans currently alive are to take advantage of digital technologies to address the most severe problems that face our species and the biosphere, computers, telephones and digital networks are not enough. We need new literacies around participatory media, the dynamics of cooperation and collective action, the effective deployment of attention, the relatively rational and critical discourse necessary for a healthy public sphere. Recently, the need to communicate across and through the use of multiple media has given rise to the study of transliteracy, pioneered by Sue Thomas at the Institute of Creative Technology, De Montfort University [8].

I believe that a participatory culture in which most of the population see themselves as creators as well as consumers of culture is far more likely to generate freedom and wealth for more people than one in which a small portion of the population produces culture that the majority passively consume. The technological infrastructure for participatory media has grown rapidly, piggybacking on Moore's Law, globalization, the telecom bubble, and the innovations of Swiss physicists and computer science students. Increasingly, access to that infrastructure-the ability to upload a Macaca video or uncover a threat to democracy-has become economically accessible.

Applied literacy, not just the theoretical study of literacy, requires cultural, political, economic access to the codes and communities of vernacular video, microblogging, social bookmarking, wiki\_collaboration - in order to use that infrastructure to create a participatory culture. A population with broadband infrastructure and ubiquitous computing could be a captive audience for a cultural monopoly, given enough bad laws and judicial rulings. A population that knows what to do with the tools at hand stands a better chance of resisting enclosure. The more people who know how to use participatory media to learn, inform, persuade, investigate, reveal, advocate and organize, the more likely the future infosphere will allow, enable, and encourage liberty and participation. Such literacies can only make action possible, however-it is not in the technology, or even in knowledge of how to use it, but in the ways people use the knowledge and technology to create wealth, secure freedom, and resist tyranny that the real power to influence our destinies, is to be found.

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## Design Processes and the Rhetoric of Creativity

Claudia Eckert

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## Introduction

Creativity is a hugely important concept for our society. Through the Cook report the government has set active targets for pushing the "creative industries", referring mainly to artistic design domains and the media, without acknowledging engineering design as a creative field (DTI, 2005). Creativity is very much part of the rhetoric of artistic design domains, such as product design or graphic design as well as industries such as advertising or music, but maybe surprisingly much less so in technical design domains, such as engineering or software design. Here the discourse is much more centred on innovation than on creativity. This applies equally to the external rhetoric, when the design is discussed with external people or the general public, for example in advertising or press coverage; and to the internal discussion with people working on the same or similar products, or in the same field. However, the more complex a product the less creativity or innovation seem to be discussed, yet the more important they become for the success of the project. In these domains the discussion is much more about the process excellence than creativity.

Design domains have rarely been compared in the past and if so the emphasis has been on identifying the common and fundamental principles of design (eg., Reymen, 2001). Understanding the differences between design domains and their causes can lead to transfer of understanding across different design domains, for example, to assess whether a process quality procedure can be applied. While design domains could be categorised in many different and equally valid ways, for the purpose of this paper a differentiation will be drawn between artistic design domains and technical design domains.

This is not a binary distinction, as many fields have technical and aesthetic aspects, but a reflection of traditional distinctions in design education and practice. Artistic design domains, such as graphic design, furniture or fashion design, have a very strong artistic component in the training designers receive and sell their products largely on their aesthetic appeal, rather than a functional distinction to other products. Technical domains, such as engineering or software development, have scientific and mathematical foundations. Products are usually distinguished by their functions or features. Many design domains and projects combine both aspects. For example architecture and construction span everything from the purely artistic to the functional and good buildings need to excel in both. While the artistic-technical distinction is a continuum, this paper will mainly use illustrations from the extreme ends, with knitwear design as an artistic domain and complex engineering as a technical field.

The example of a car illustrates that these two kinds of design domains often come together in a single product. Car styling is artistic design. It is very much subject to fashion and appeals in a holistic manner through its aesthetics to many potential customers. Many customers select cars to make statements about themselves. Yet a car is a highly complex technical product, developed by mechanical engineers, electrical engineers and software engineers, which is optimised for cost, reliability and performance. On details of the car, artistic and technical designers collaborate to generate a functional product. For example for the design of a car seat, mechanical engineers design the structure, textile designers design the



covers, ergonomics experts test the shape and software designers work on the control software for the adjustments. In this example, the expertise of individuals tends to be either technical or artistic; however in some domains the skill sets of individuals cover both aspects. The same continuum between artistic and technical design exists in the role a product designer can have. Sometimes they engage nearly entirely in aesthetic design, when the technology already exists, for example in styling a kettle, but at other times they get deeply involved in the technical and ergonomic realisation, as they do in the design of medical products. Architects or the designers of web pages are continuously combining the technical and aesthetic in their own work. A building will only succeed if it combines technical performance with aesthetic appeal.

All design domains are about the creation of new and distinguishable products. Creativity is at the heart of many design activities. However it is important to remember that many tasks associated with the design of a new product are neither creative nor what we would immediately associate with design. To return to cars as an example, a lot of car design is applied mathematics, calculating properties of the product, such as stress, loads or airflows. Many tasks are strictly managerial, making sure that all the hundreds of people and thousands and thousands of documents work well and effectively together. Other tasks, however, are highly creative, both in the aesthetic and the technical aspects of the product.

The phrase 'design process' has two distinct but related meanings. To understand creative processes, it is worth distinguishing between them. One meaning of process is the actual sequence of activities - what the people actually do. In this sense every design and every designer has a process, since a sequence of tasks needs to be carried out for anything to be designed or made. The second meaning of process is a series of explicitly named steps constituting a description of what happens or should happen in the development of a design, formulated in abstract enough terms to apply to the design of a range of different products. As in a cooking recipe the steps that designers must take to design their products are laid out, often with guidance for checking the quality of the product or the execution of the process.

Technical industries, such as engineering, software and construction have been defining formal processes and applying them to projects carried out in the organisation since roughly World War II. While the processes differ between organisations they are often derived from well-known published prescriptive formal descriptions of procedures. For example most engineering companies follow some kind of stage gate process, based on Cooper's stage gate model (Cooper, 1990). These processes are abstract and define an overall sequence of steps, even if they are defined to considerable detail, they are not tailored to the design of a specific product. Most software companies follow a particular development methodology from which their process is derived, such as Rational Unified Process or Agile programming, though methodologies are often customised for individual projects. In artistic design domains designers also follow repeatable processes, but that these are rarely written down and talked about.

Creativity needs structure to flourish to allow individuals to be creative, rather than work opportunistically or be tied up in perpetual fire fighting. Coherent structured processes are required to give designers a space and an incentive to be creative and to make sure that creative design ideas are delivered on time and on budget. This paper will investigate the relationship between the emphasis given to processes in different design domains and the creativity that occurs in them. The paper will argue that in artistic design the emphasis of the rhetoric is on the creative individual and their creative insights rather than on the quality of the execution of the often highly repeatable processes. By contrast designers in technical domains talk about their process to assure their customers about the quality of their product, but often de-emphasise novelty and creativity. The next section will introduce the empirical studies, that this argument is based on, before introducing some fundamental differences between design domains in following section. Thereafter, creativity in artistic and technical domains is discussed and points out that both are different ways of reframing problems. The final section discusses how the rhetoric of creativity varies between design domains.

#### The case studies

This paper draws on two types of case studies that the author carried out in the last 15 years: very detailed case studies of particular processes in the textile industry and in engineering and a research project to look at comparisons between design domains, based on the witness statements of individuals.

#### Across Design as the wider context

The Across Design project, carried out in collaboration between the University of Cambridge and MIT, was designed specifically to compare across a wide range of design domains based on the designers' own descriptions of their work (Earl et al., 2005). While the participating researchers had experience of engineering, architecture and software, the project invited overall 22 designers from a broad range of domains to 7 workshops. The workshops included representatives from classical design domains like product design, architecture, engineering, software, fashion design and graphic design, as well as people who would not be immediately thought of as designers, like a documentary maker, a food chemist and a drug designer. All designers were experienced successful professionals with between 5 and 50 years of professional experience. They were well respected in their fields, but usually unknown outside them. The participants were provided with a list of issues pertinent to design, that the research team had identified before the workshops, however they were encouraged to speak about an exemplary project however they chose. This biased the presentations to some extent towards talking about the organisation of their processes and the big picture of their activities, rather than describing in detail what they do. As explained in Blackwell et al (in press) the designers were invited to bear witness to their processes in the way they wanted to present themselves and their field.

#### Detailed case studies of design processes

The Across Design project came out of years of research into design practice primarily in the knitwear industry and the aerospace and automotive industries.

The knitwear industry was studied in a combination of observations and interviews in 25 companies in the UK, Germany and Italy, focusing on communication in design process (Eckert, 2001) and the use of sources of inspiration (Eckert and Stacey, 2003). Knitwear design companies follow the same sequence of tasks regardless of their position in the market, however they vary significantly in the effort and resources they place on individual tasks and the iterations that occur in the process (Eckert, 2006). The author's model of the knitwear design process contained 140 tasks, but fitted the process in all sectors of the knitwear market. Variations arose in the effort put into individual tasks and the number and depth of iterations (Eckert, 1997). Knitwear processes are typical for the fashion industry, but knitwear design is technically more challenging than tailored garments, because the shape and the material are generated at the same time. Unlike engineering companies knitwear companies put very little effort into improving their processes. The processes are not documented, even though designers can describe them.

The studies of engineering companies, mainly conducted through interviews, were aimed at understanding how the designers of complex products plan their processes (Eckert and Clarkson, 2003) and make changes to existing products (Eckert et al., 2004). This paper will draw in particular on a long standing interaction with a diesel engine company. Diesel engines are very mature products, but regular innovation is required by increasingly stringent environmental legislation (Jarratt et al., 2003), which sets tight deadlines by which the diesel engine company has to have a compliant product on the market. With ever increasing product complexity and decreasing time allowed for development, they depend on reusing large parts of existing solutions. The company has generic new product introduction processes, which set gateways with deadlines and targets, but more detailed planning needs to be carried out at the beginning of each project. When only modification needs to be carried out, they have a task sequence that they can repeat; however when innovation is required, it is extremely hard to predict what tasks will get them there. For many routine design activities the tasks can be predicted accurately. For some problem areas in the design it is only possible to allocate time and assign the best engineers to the problem and hope that a solution can be reached. Big problems can occur in design processes when the scope of change of a component is exhausted, so that instead of being able to make a minor modification, far reaching redesign becomes necessary.

#### Fundamental differences between the processes

Design behaviour is enormously varied. Each designer has his or her own way of working and each team develops its own dynamics. The product that is designed influences its design process in the most fundamental way. Design processes vary enormously in scale. A small design project can take a single designer a few hours, while the big engineering projects can take several thousand people several years. However, it is still possible to identify factors that cause variation between design processes. These

factors influence fundamentally how the design activities are conceptualised by the participants and in consequence how they are discussed by the public.

#### Repetition

Some designers design a wide variety of different things. Many artistic designers don't only design products in the fields they trained in. For example a furniture designer might design lighting, a knitwear designer tailored fashion. Technical expertise by contrast often makes someone a complete specialist spending a professional career designing one particular component of one particular product and becoming a world expert in it. The variability in the tasks of the designers depends on the range of products the company produces and the size of the organisation.

Bigger companies tend to employ more specialists. For example some product designers and engineering designers work for consultancies, where they design a whole range of very different products, whereas others work for the manufacturer of a particular product and design the same kind of products every season. This has an obvious effect on the processes with which the product is designed. Consultancies often have very structured processes, because the process is the constant factor in their work. Companies that design very similar products every time might have very well worked out processes, but they might also think that they know what they are doing and therefore not see the need to formally prescribe their process. Again large organisations with high staff movement, tend to have more formally described processes for repetitive tasks.

#### Overconstrained/underconstrained

The analysis of processes in different industries has shown that one of the key differences between design domains is whether the problems are overconstrained or underconstrained. Overconstrained problems have contradictory requirements and constraints that they have to meet; while underconstrained problems do not have enough constraints to fully determine the solution. They remain open-ended. Artistic design problems are typically very underconstrained. Fashion and customers' requirements provide some indication of what is required, but rarely set firm constraints.

The designers need to provide a set of suggested solutions to the customer that meet their needs and ideally exceed their expectations; however the designers themselves have to find a way to come up with such a solution and need to justify the design. For example knitwear designers for high street fashion chains are given an indication of the themes that their customers want and the distribution of the types of garments, but are entirely free to interpret within the stylistic constraints of their place in the market and the few technical restrictions imposed by the means of manufacturing. At the same time wider fashion places tight but tacit constraints on the styles, materials and colours that are acceptable for a season.

By contrast technical design problems are often very overconstrained, making the application of standard procedures and techniques insufficient, even to the extent that it seems impossible to meet the requirements. For example diesel engines need to meet ever more stringent environmental legislations, while increasing performance and efficiency in every generation. At the beginning of a design process it might seem impossible for designer to meet these constraints. In most cases they can only develop a satisfactory solution by relaxing the constraints that they placed on them.

#### Objective/subjective evaluation criteria

Constraints provide designers with criteria against which they can evaluate the design. Technical design domains also have specifications against which the designs can be evaluated. Technical evaluations are usually objective. Have the performance criteria been met? Is the weight target being adhered to? Most of these evaluations are measurable. The situation is very different in artistic design domains, where many of the design features are aesthetic and many of the criteria are subjective. Much of the evaluation is done intuitively: characteristics are perceived rather than reasoned about. Artistic designers often comment that they know a good design when they see it, but they often cannot say why or only by analysing the successful design, nor can they articulate the criteria that inform its creation. The quality of artistic design is rarely measurable and any measure could potentially be misleading, since the success of a design often lies in its surprise.

This division has huge implications for the design process. Clear and objective evaluation criteria aid the separation into design tasks and thus the division of labour between different team members. It also enables the individual to distance themselves from the success of the overall product,

when it can be demonstrated that a particular aspect of the design has been successful. Artistic design domains often have technical aspects, which can be accessed objectively; however the overall evaluation of the product is often holistic, making it difficult to assign clear credit to any particular individual.

#### Guarantor of success

When an objective evaluation of the product is possible, the success of the final product is easier to predict. While markets are inevitably fickle, knowing that a product does meet its requirements does provide some guarantee of success. In highly technical fields, like diesel engines, companies also have a clear understanding of the strengths and weaknesses of their competitors' products as well as their own. They can therefore gauge their likely success.

In artistic products this is often far from straightforward. The success of the product often depends not only on the product itself, but on the market at large. Both direct competition and general trends influence the acceptability of the product. It is equally difficult for customers and clients to judge the success of the product. The designers and their reputations become in many ways the guarantor of success, rather than any objective property of the product itself. A design is viewed as successful because it is designed by a certain designer, and owning a design by the designer confers a certain degree of status. To succeed designers need to build up reputations for themselves. Breaking in can be challenging as the media coverage is also attracted by big names. This makes designing a very personal business for many artistic designers.

Repetition of activities and products is seen as a guarantor of success, because proven solutions carry less risk and a positive track record is important when designers can draw on past experience. Even in artistic fields, where novelty can play a great role, the work of well known designers can be quite similar over years. As designers find their style they become known for it and some become typecast. However even if their designs are repetitive, they can still be seen as creative, if subtle adaptations meet emerging trends.

#### The Hidden and the Open Process

Every product has a process by which it is designed, where some elements of this process are open and freely discussed, but others are tacit. Elements of processes can be tacit at different levels: the activities themselves can be tacit, for example fashion designers can't articulate exactly how they fine tune their perception to new styles and trends; decisions can be taken tacitly without participants being conscious of having made a decision, and the sequences of activities can be tacit, in that designers don't stop to think whether an alternative sequence would be possible. In some cases the local behaviour is driven by explicit goals but the overall structuring and strategy use is tacit, but the opposite can also occur where the overall goal is clear, but the steps are tacit. We can distinguish between three types of activities: formally specified activities, where the steps are specified, and in some design processes correspond to those prescribed by a methodology; informal activities with clearly articulated goals; and tacit activities where the performance is driven by the situation. However the balance between these varies between domains and to some extent individuals. Some designers are, as individuals, much more aware than others about the process that they apply and in consequence better able to articulate it.

Artistic design processes are often largely tacit. Many of the key activities are difficult to articulate. Sometimes designers are not even fully aware that they are carrying out a vital aspect of their design processes. For example the knitwear designers carry out systematic design research at the beginning of a season. They go to trade shows and visit shops and exhibitions. Throughout the entire year they keep an eye out for ideas for garments, often during leisure activities like walking on a beach. By doing so, they form an understanding of what the new fashion will look like; however they might not be fully aware of how they gain this understanding, nor that they are making implicit design decisions. The knitwear designers were very articulate about their design processes to a considerable level of detail, some delivered - when asked - complete accounts, others responded to questioning. However knitwear processes are rarely documented internally and the designers did not use diagrams to describe their processes.

By contrast engineering processes are typically well documented at a high level, but the details of engineering activities are less well understood than artistic design processes, which are often very similar between different products. The documented processes only capture abstract properties of





the entire process and the actual sequence of tasks typically diverges from descriptions that are often highly idealized. Single individuals rarely have sufficient overview over the process to relate reality to prescription coherently and often only understand a small part of it. The processes required to design highly complex products, such as helicopters or jet engines, are sufficiently complex that nobody has a sufficient overview of the product or the process, so that an additional layer of management tasks or personnel is required to manage these processes (Flanagan et al., 2007). Documented processes are idealised versions of the processes that are described. What can be described is only a fraction of what designers tacitly know and carry out. Small scale repeatable processes are much easier to describe, but there is also less need to do so. Complex processes need external representations, such as diagrams and descriptions, to be understood and managed, even if describing them is difficult, and descriptions of different parts of the process often don't fit together easily. Processes are described for a variety of reasons, including planning, monitoring and recording progress, using very different units, such as activities, delivery dates, costs, etc. When engineers use very different ways to describe parts of a process, the way these are combined and their overall understanding of the process are tacit (Eckert and Clarkson, 2003).

### Creativity in different domains

Creativity is a vital part of all design activities, but it occurs sometimes in surprising places. Creativity has been studied and discussed from many different angles (see Sternberg, 1999, for reviews of a variety of different approaches), with a lot of debate about what creativity is (see Boden, 2003). Here the term will be used in a common sense meaning, as it is employed by designers themselves. Design is not a priori creative, just because it is design. To be considered creative a solution needs to be new or newly brought to the field. However it is important to recognise that creativity can lie in the development of innovative processes for creating products, not just in innovative products.

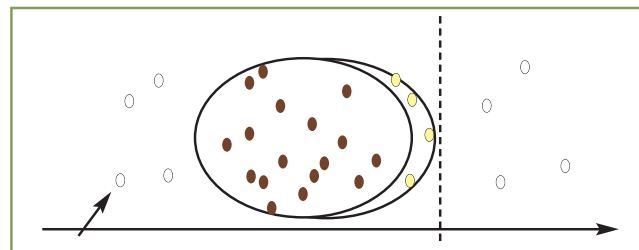
### Artistic design

In artistic design domains many products are functionally identical. One jumper does pretty much what another one does. Technical innovation in design of particular products is rare, but does occasionally happen, for example in the design of sportswear which incorporates solar panels to charge mobile phones or MP3 players. Technical advances in the means of production often spur a flurry of product innovations and can generate needs in the market, as the invention of Gore-Tex or microfibre fleeces illustrate. Even in those cases many designers across the world will explore the same technical possibilities. Therefore artistic designers have to differentiate themselves through the aesthetic appeal of their products.

Artistic designs are usually subject to fashion, so that the range of possibilities changes with time through the influence of designs on each other. Designers need to find ways to distinguish their own designs from others in the marketplace. The products need to suit both the fashion trends and the tastes and needs of the target customers. This provides a set of constraints for the design, which provide an envelope of possibilities for fashionable designs, which moves through the evolution of fashion styles. One of the skills of the designer is to position their design exactly where they want to be within the evolving fashion and the position of the company, as illustrated in Figure 1.

Figure 1

Conservative designs Novel designs Irrelevant designs Out-dated designs time now



The evolving envelope of acceptable designs in fashion products, taken from Eckert and Stacey, 2001

Artistic designers are constantly on the look out for ideas and inspiration in their daily private and professional life. They use the fashion products around them to fine-tune their perceptions. Repeated occurrences of the same things, raises their awareness of new features. They tire of them when they reach saturation, and they know it is time to move on to the next new things. This way of understanding fashion and evolving styles is very personal. Artistic designers' creativity lies at least as much in their constantly evolving understanding of fashion - and therefore their ability to recognise the merit of an existing idea in a new context - as in the synthesis of new designs. While designers are aware that this is how they gain their understanding of the design space, they are not aware of it happening. This is an entirely rational process that can be explained through the basic psychological mechanisms of pattern matching and pattern reinforcement (Eckert and Stacey, 2001). However it is difficult for designers to explain their judgements. This accounts in part for the rhetoric of creativity as being highly important and personal and also the mystification of creativity that occurs in many discussions of artistic design to people outside the design process.

### Technical design

Technical design industries are much more concerned with innovation than with creativity as such. The emphasis is placed on the new ways in which the product meets new or existing needs. Technical domains define their requirements as carefully as possible, to be sure that they are correct, which later allows them to evaluate their design against these requirements, and defines the scope for required innovations. At the same time the requirement specification should make it straightforward to solve the problem; however in practice many problems are over-constrained. In complex domains, it pays companies to be as innovative as necessary, but reuse as much as possible to minimise the risk of failing to developing a good product on time and the risk to the customer of using new technology. New components or systems, whether they are completely novel or transferred from another product, introduce risk, not just because of their own properties, but also because of potential knock-on effects of the new parts on parts that are intended to be kept constant (Eckert et al., 2004). The risk of change propagation can itself lead to innovation in an attempt to stop propagation. In some companies this "emergency" innovation accounts for a substantial fraction of all innovations (Eckert, et al. 2007). Innovation also does not necessarily require novelty, as a straight transfer from one domain to another can be sufficient.

The need for creativity arises in several distinct places in technical design domains. It is extremely critical to identify the correct requirements of the product. There is a large scope for creativity in understanding the needs and potentials of the market and finding ways of translating those into technical requirements. For example an automotive company might identify a market opportunity for a small masculine sports car; and need to find a way of translating small and masculine into dimensions for the chassis and power requirements for the engine. Much of the creative activities of software developers lie in identifying, interpreting and prioritising requirements. Once these are clear the actual implementation can be fairly routine.

At this point most products are over-constrained, and designers have to come up with a solution that meets conflicting requirements as well as possible, which involves two distinct but integrated operations, relaxing constraints and finding solutions. Finding a solution can involve developing new solution principles or applying existing ones in a new way. Creativity methods in engineering, such as TRIZ (e.g. Altshuller, 2002), are intended to expose engineers systematically to the possible solutions to given classes of problems, which in this case are formulated as contradictions in the requirements. The conceptual design of complex products can be quite similar to design in artistic design domains, in that it can be quite intuitive and based on other designs as inspirations. For example the diesel engine company we studied has an apprenticeship trained conceptual designer, who develops concepts for the engines, based on a phenomenal understanding of the products gained from hands-on experience and having seen generations of products. He can make vital trade-offs in his mind in real time, for which others would need to set up mathematical models. A third important place for creativity lies in resolving problems that occur through the design process, either because unforeseen issues crop up, somebody made a mistake, or a change to one part of the product propagates to another. This is creativity under time constraints as well as technical constraints. The solution needs to be found without delaying the overall programme. These are real pockets of creativity and many of the solutions that are born out of necessity are carried forward to the final product.

### Creativity as problem framing

The modes of creativity overlap between artistic and technical design domains. Technical domains require a greater amount of solving over-constrained problems; while artistic design requires a detailed understanding of the context, where creativity often lies in finding the right place to start. However these are two aspects of the same basic psychological phenomenon: problem framing. Designers need to find an appropriate way of conceptualising their problem, which turns an ill-structured problem that they cannot solve into a well-structured one that they can solve. In artistic fields, this can be identifying elements which would constrain a problem, while in technical fields this can be a matter of identifying those constraints that can be relaxed. Both cases lead to reframing the problem, so that a solution can be found. Typically this involves abstracting the problem and then finding new ways to make it concrete.

In artistic domains an important aspect of design creativity is in spotting opportunities and finding starting points for their ideas. For example in knitwear design, designers draw on other knitted or tailored garments for inspiration, and make use of other natural or designed objects as starting points for their own ideas (Eckert and Stacey, 2003). The skills involved in finding ideas and identifying their significance are largely tacit.

### Drivers of the design rhetoric

Creativity is a vital part of all design domains. No domain is a priori more creative than another. The creation of each design involves a combination of activities that are more creative and others which are fairly mundane and repetitive. In small projects the same person carries out all aspects of designing, but in complex design projects many people are solely hired to carry out activities which don't seem very creative. In this sense the scale of the project affects the perception of the creativity involved. What is different between artistic and technical design domains is the rhetoric that surrounds it. The rhetoric of marketing is different for technical and artistic products. However this has little to do with the processes through which the product is created, rather than with keying into public perception; and is very different to the self portrayal of practitioners.

Designers often don't know much about what people in other design domains do or how they work and therefore have very stereotypical ideas of other designers work, but even if they collaborate closely they might not recognise the creativity in the work of their colleagues. For example, knitwear designers and technicians work together closely on developing garments. The knitwear designers design the overall visual and tactile appearance, but the technicians do much of the detailed design. The designers rarely recognise that the technicians engage in creative problem solving, and can be quite disrespectful of the technicians' professional expertise. In return the technicians sometimes struggle to see the creative skill in developing a tacit understanding of the context. This has much to do with how both groups talk about their activities.

Representatives from technical design domains are very concerned with minimizing the perceived risk associated with the product. They will highlight the analysis and testing activities that they have carried out. They stress the rationality of decisions made in the process, pointing to objective aspects of the product. The design process is portrayed as a means of achieving low-risk products. Therefore the structure and quality control is emphasised in discussion of the process. The process is portrayed as a repeatable and rational operation. This is quite striking in the design of turbine blade cooling in jet engines. When Bell et al. (2005) dug deeply, it became clear that the fundamental design is done using tacit perceptual skills, where designers apply a deep intuitive understanding of the behaviour of blade cooling systems to creating and evaluating the layout. This is quite akin to many artistic design processes. However if the designers were asked how they designed turbine blade cooling, they provided long explanations about their analysis tool.

Technical processes are portrayed as rational sequences of activities, where innovations happen in a planned manner at the beginning and later tasks follow well established patterns. Designers in technical domains talk both internally and to people outside the organisation, about the idealised prescriptive processes as being the processes that they follow. However underneath the highest levels of structured tasks, the processes are quite chaotic, opportunistic and full of fire fighting. Everybody knows this, but people are reassured by the logical understanding that is implied by a structured process description. This makes technical design processes elusive and creativity difficult to pinpoint.

Technical products are rarely associated with a single designer, nor would that be fair, since they are inevitably the result of the collaboration of many experts. With objective evaluation criteria it is also possible to separate the quality of the work of an individual from the success or failure of the whole product. Therefore the creativity of the individual is downplayed in favour of the innovativeness of the whole product. Within an organisation, it is often well known who is creative and employed in a process accordingly. Creative ideas too late in a process are often not welcome, because they are seen as sources of unplanned or additional work. This has some justification, because of the potential knock-on effects of creative ideas. Creativity is therefore seen as a mixed blessing, and the rhetoric concentrates on rational repeatability as opposed to creativity and serendipity.

In artistic design rhetoric is very much about creativity and the designer as a creative individual. For many clients or customers it is difficult to assess the artistic merit of the product or to gauge how the product stands as a fashion or design statement. Their risk lies in making a "wrong" purchase. They need to trust the designer that a quality product will be delivered and the designers must assure them that they are able to do so. The designer is the personal guarantor of the quality, for which novelty and thus creativity is seen as an important element and the rhetoric of the designer as a creative individual is set to reassure people. Designers are portrayed as having a sometimes unique creativity that others don't share. In the absence of objective criteria to distinguish between two brands offering products of equal technical standard and functionality, it is possible to talk up the standing of artistic designers. The media plays a huge role in selecting and showcasing the work of individuals, thereby conveying to the purchasing public that an endorsed product is a safe object to purchase. By drawing the attention to the designer as an individual, the role of the repeatable process is downplayed. Design is depicted as deriving from the creative ideas of an individual, who is free and unconstrained by process. However on closer inspection, the process facilitates creativity, and designers construct their own personal processes and habits to come up with ideas in the absence of prescriptive organisational processes. Many of the skills of an artistic designer are perceptual: they need to recognise elements of the context as significant and find suitable starting points for their designs. This adds to the mystique of artistic design. However they use rational processes, as much as in the technical fields, but these processes are harder to describe because they are tacit.

### Conclusion

Process and creativity both play a key role in all design domains. Products need creativity to be novel in the market and the creativity needs effective processes to flourish and translate ideas into products that will hit the market on time and on budget. The predominant modes of creativity are different in artistic and in technical design, with the emphasis in artistic design lying on the identification of the context and the selection of starting points and in the technical fields on problem solving activities. The rhetoric of different design domains is governed by the risk that the purchase poses to customers. It results in technical fields playing up the role of structured and repeatable processes, when the design processes in practice are often very ad hoc; and downplay the role of creativity, as it is a source of newness and therefore product risk. By contrast artistic design domains do not wish to appear formulaic and therefore downplay the role of the repeatable processes most designers follow, but emphasise the creative talent of the individual.

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A Million Penguins: An Analysis

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Introduction

In February 2007, Penguin Books and De Montfort University launched “A Million Penguins”, a collaborative novel open to anyone who wanted to help write it. The novel was to be created on MediaWiki, the same software as Wikipedia, with a similar ethos of collective authoring but the added spice of a risky experiment in the heartland of commercial publishing. “Can a community write a novel?” asked Penguin Digital Publisher Jeremy Ettinghausen. “Let’s find out...”

Seeded with a first line taken from a volume in the Penguin Classics series, the wiki invited contributions over a five week period. The result may not have been a novel as we know it, but it certainly produced a community of collaborators who created what John Mackinson, the Chief Executive of Penguin Books, called “not the most read, but possibly the most written novel in history”. The Penguin wikinovel, as it came to be known, touched a nerve in many quarters of the literary world and provoked great excitement in the social media community. The level of reaction in the media and across the web showed that there was a real interest in the project despite the fact that many critics dismissed it as a “PR stunt”, “badly written” or, in the words of Jordan Jack writing in the Yale Herald “the worst book I’ve ever read”. Linux.com solicited the views of Douglas Rushkoff, and the Internet guru was not optimistic: “A Million Penguins looks like fun, but it’s still likely to remain more a million penguins than a cohesive or coherent bird”, says Rushkoff, who points out that every book needs its author. Other commentators suggested that the wiki was likely to be a failure, albeit a “delightful” one. It was certainly unorthodox. The authors who came together were not the usual writerly stereotypes scribbling away alone in attics, but an intriguing mix of ‘gardeners’ intent on nurturing the novel; ‘vandals’ determined to ruin it, and ‘performers’ hoping to make it showcase for their talents. What they created together turned out to be quite unique. Later Ettinghausen would blog: “as the project evolved I think I stopped thinking about it as a literary experiment and started thinking about it more as a social experiment”. A year on, he now says “it’s the best thing I’ve ever done ... but I would never do it again”.

Research Framework

This paper focuses on some of the social behaviours that occurred during the time the wiki novel was live and attempts to understand them within the context of wiki culture. The research focused on two questions: what was the role of the discussion around the writing, and what patterns of social behaviour occurred among the contributors? Framing the research questions in this way allowed us to approach “A Million Penguins” as a cultural text and, inevitably, led us to critique the question underlying the wikinovel experiment - “can a community write a novel?”

The social behaviour of the contributors was tracked through analysing their communication in the wiki novel, their discussions in associated blogs and, where possible, through direct contacts. The results showed a complex set of interactions and understandings that questioned many of the assumptions about the experiment in specific and wiki sites in general. Much of the media commentary about “A Million Penguins” - as excerpted above and explored in more detail later - treated the project as a failure because no community was seen to form and no recognisable novel was written. The research indicates, however, that many of the commentaries show a fundamental misunderstanding of the nature of the processes behind the wikinovel and of the final product itself. Close analysis of what people wrote, where, when and how they wrote it, has persuaded us that we need to look to a tradition of artistic performance that is very different to the printed novel. To do this we will draw upon the idea of the carnival as espoused by Russian philosopher, Mikhail Bakhtin.

According to Bakhtin, a folk carnival provides a lens for the analysis of culture, language and narrative. It is our contention that the way the wiki novel was set up implicitly framed the setting as a virtual place in which a carnival could occur. Like a carnival, the wiki was bounded in space and time and provided an opportunity for ‘ordinary folk’ to hold a barely controllable party. Unlike a wiki, which is meant to evolve ‘organically’ through multiple edits in such a way that no one ‘voice’ dominates, a carnival is a moment of excess featuring multiple competing voices and performances. Indeed, the activities we uncovered in “A Million Penguins” challenged the ‘garden’ metaphor so widely used to characterise behaviour in wikis. According to this metaphor, a wiki grows successfully when it is properly seeded with content and tended by gardeners. The wiki novel was in no way a neat, orderly wiki and, as we’ll see, many of the norms of wiki behaviour and aesthetics were turned on their head in “A Million Penguins”.

The interpretation of this work leads us to suggest that the wiki novel was neither a wiki nor a novel as the terms are commonly understood. We will argue that critics of the experiment who bemoan its failures as wiki, novel or both are misunderstanding the kind of text that it actually is. To do this we will tell the story of the experiment by looking at the stories and the people behind them, and explain how Bakhtin’s notion of carnival provides a way to interpret “A Million Penguins” which opens up further avenues of exploration for this unique cultural text.

The Experiment

It could be argued that a wiki is what Tim Berners-Lee, the inventor of the web, always wanted the web to be. Fast, simple and dynamic, it provides a collaborative means of knowledge building, sharing and representation. At its simplest a wiki is a web page that users can edit as well as view. The first successful example of a wiki webpage was made by Ward Cunningham on March 25th, 1995. He named it the “WikiWikiWeb” after the Hawaiian word for quick: “wiki wiki”. The subject of his wiki was focused on the discussion and elicitation of patterns of collaboration in software development, and it still exists today. He described it as “[t]he simplest online database that could possibly work”, and WikiWikiWeb remains enormously influential both as a trail-blazing piece of technology as well as a source of information about patterns of behaviour in wikis.

Cunningham’s notion of the wiki is fundamentally linked with the concept of open source development. He posited several design principles that should govern any wiki, all of which are grounded in the belief that if multiple people collaborate over time in an open system in which both the text and the organisation of the text can be freely changed then self-organising patterns would arise. This belief has driven the development of wikis ever since. Most notably, the wiki software, UseMod Wiki, was adapted to run the original version of Wikipedia.

The most famous of all wikis, Wikipedia was originally created through the use of UseMod Wiki software, although the software was later rewritten and spun off into a standalone open source wiki platform: MediaWiki. The success of Wikipedia allied to the open source nature of the software has

meant that MediaWiki has become an extremely popular wiki tool in its own right. So, when Penguin Books came to select the wiki software for “A Million Penguins” MediaWiki was the obvious choice.

Wikipedia

People who don't know what a wiki is still know of Wikipedia. It is routinely listed in the top ten most visited sites on the Internet. Currently, it contains 2,321,943 articles; users have made 214,497,975 edits since July 2002 and there are 6,835,839 registered user accounts. Wikipedia is both the example against which all other wikis are judged and, by virtue of its size, a completely atypical wiki. There is nothing else like Wikipedia. (http://en.wikipedia.org/wiki/Main\_Page)

Penguin’s goal was to explore the potential for innovative collaborative online fiction. They invited new media author Kate Pullinger and Professor of New Media Sue Thomas, along with their students on the MA in Creative Writing and New Media at De Montfort University, Leicester, to help design and manage the experiment. At a meeting at DMU’s Institute of Creative Technologies in November 2006, it was agreed that Penguin would provide technical resources plus two editors: digital publisher, Jeremy Ettinghausen, and his literary editor colleague, Jon Elek. Elek was more accustomed to working with authors such as Will Self and had relatively little experience of new media. The DMU team would provide consultation during development and oversee day-to-day operations, and was led by Kate Pullinger supported by Sue Thomas, working with Masters students Toni Le Busque, Jo Howard, Alison Norrington, Kirsty McGill, Chris Meade and Christine Wilks.

During the planning phase the team discussed issues like what might be the best structure for the novel, and how to limit undesirable behaviour including the possibility that people might upload whole chunks of their own unpublished works. They considered creating a complex set of rules such as setting a quota of 250 words per person per day. But such constraints are anathema to the spirit of the wiki, and the team knew that however well they planned beforehand, they must be prepared to be highly responsive and flexible once the project was live. The best they could do was expect the unexpected.

Wiki Editing

In a wiki everything about you can be seen in the way you edit. The editing process is simple to do, but conceptually very difficult to grasp until you have tried it. Essentially, anyone can edit anything you write and you can edit anything that they write. That means your text can be revised, improved, deleted or rephrased at any time, and that you can do the same. The element of the wiki that keeps this together is the History page, where all previous edits can be seen and which can be used to revert to earlier versions. So whilst anything can be deleted, nothing can ever be lost.

The wiki was opened to the public on Thursday February 1st 2006 with a line from Charlotte Bronte’s Jane Eyre “There was no possibility of taking a walk that day”. It soon became evident that there would be little possibility of respite for the team over the coming weekend. Almost immediately, visits from interested surfers worldwide overwhelmed the server and by Friday morning the website had gone down. People were already wondering whether Penguin had succumbed to ‘wiki-fear’ evidenced in June 2005 when the Los Angeles Times opened a wiki editorial (a “wikitorial”) for only one afternoon before closing it down for good in the face of lethal amounts of vandalism. But Ettinghausen and the team did not lose their nerve, and by lunchtime on Friday the wiki was back, moved to a larger host machine and ready for further onslaughts from eager writers. The project team organised itself to work around the clock across the weekend to keep on top of the furious rate of changes, vandalism and spam. Their private email discussions of that time illustrate their acute anxiety about their ability to succeed, with numerous concerns about lack of sleep and the physical exhaustion of keeping up with the job of policing so many edits. By Monday the team had instituted a nightly “lock down” period providing much-needed breathing space to purge the novel of its daily accumulation of spam and pornography. On February 8th, Kate Pullinger wrote in the team blog “[t]here’s a wiki-storm raging at http://www.amillionpenguins.com and we’ve been battenning down the hatches, chopping down broken branches, and hammering plywood across the French doors, so to speak”.

On the same day Toni Le Busque posted “The first few days I would log on and drop my head into my hands in despair,” and Jo Howard added, “I’ve had a similar experience of rage and despair,” Alison Norrington found the experience “frustrating and yet frenetic, addictive whilst also extremely annoying”.

With time, however, the initial rush slowed down and the growth became steady and more sustained. By the time the wiki was finally closed to contributions on 7th March 2007, at least 75,000 different people had viewed the site. Of those, 1,476 people had registered as user and had between them made over 11,000 edits to its 1,000 plus pages.

Spammers, hackers and wikicitizens

Wiki research has uncovered several types of behaviour in wikis. Some contributors become good “wikicitizens” interested in developing and expanding the work. They may disagree with each other about the details and occasionally behave badly while so doing, but they share a common purpose. Others are thought of as vandals or “trolls”, interested in disrupting, maybe even destroying, the wiki. In addition, the site may be invaded by spammers trying to sell their wares or hackers looking to use the web page to infect careless users with malevolent software. When looking at the contributors to “A Million Penguins” the spammers and hackers need to be filtered out as they were really just part of the context in which the site existed.

To examine the types of more general behaviour on “A Million Penguins” various questions need to be asked. How frequently did people edit? Which bits of the wiki did they edit and what does that tell us about them? What kinds of edit did they perform? For example, did they add new text to the novel, focus on editing the text of others or on organising the content? Did they try to promote their text or were they interested in more collaborative authoring? And who were these self-appointed writers? Why did they work so hard on this very anarchic experiment? It’s easy to remain anonymous on a wiki and there is no way to identify or contact people who wish to conceal their identities, so although it was possible to contact a few of the participants for the purposes of this report, most remain shrouded in mystery. For the most part, we must read their characters and writerly intentions through the work itself.

Pabruce - the performer

Pabruce was the most frequent editor of the wiki. With 1,780 edits starting from the day after the wiki went live to the very last moments, he was a major force in “A Million Penguins”. His final update to his user page reads “had a wonderful time. The bull has left the china closet”, and this exemplifies his dramatic self-portrayal. Pabruce was a performer and he saw his role as precisely that. In one of his final edits he wrote in Sentinel68’s user page, “I started out butting heads with you in the first weeks, simply because I am a Leo, and we like to have our way all the time (grin)...”.

Pabruce frequently edited talk: Welcome, the main discussion forum making 64 edits in all. Once he discovered the page on February 7th he made nearly 90% of all the subsequent edits to it, turning the page into his own fiefdom. His first edit was to suggest some alternate first lines and he built from there, adding content throughout the page. Although he did edit text and perform other types of gardening, he preferentially focused on editing the text that he had created and moulding the novel to fit the shape he preferred.

Pabruce’s first edit of the novel is emblematic of his style. He jumped right into the main page, taking a passage which had already become central and adding his own twist to it.

| Before  | Pabruce's edit  |
|---|---|
| I could feel it dancing across my skin: the electricity in the air made the hairs on the back of my neck stand on end. I anticipated the roar of thunderous claps followed by the intense light show. Above, the storm had... | My skin crawled as the strychnine kicked in and the acid slowly crept up my spine. Was I ready for eight more hours of this? Harold used to talk about making the grass grow into monsters, or the songs ice crystals made at midnight, but this was normal for me. As normal as anything could be. HA! I could feel it dancing across my skin. Electricity. The very air made the hairs on the back of my neck stand on end. Now I had only to anticipate the roar of thunder that always followed the laser show. Above, the storm had... |





From this intervention onwards, strychnine and various re-workings of it became a central motif in the wiki novel, and Pabruce became an instantly recognisable voice. Although there was supposed to be an ethos of “leaving your ego at the door” it was always obvious when some text had been added or altered by Pabruce. Just in case it wasn't obvious, he used his user page to track what he was responsible for.

*My main contributions were:*  
*to create the first list of Characters in Order of Appearance to first create hyperlink on all the characters throughout the novel (at least at one point in time... it is HARD to keep up!)*  
*to create the list currently titled, Alternative Versions of the Novel.*  
*I introduced strychnine to the novel and added the first hyperlink notes there.*

The side-effect of this was that not everyone approved. Sentinel68, in particular had some altercations with him and on the 13th February another contributor wrote a version of Pabruce into the wiki novel, effectively turning an active contributor into just another wiki character. This action outraged the real Pabruce so much that he publically “left” the wiki novel, writing,

*Okay you win, I just deleted everything I can find that I edited into this novel. Going to my myspace page and entering a thinly veiled version of my real name INTO the novel is too weird. Get this, I am out of here. If you persist I will report you, it is too much like stalking.*

Pabruce's outburst was one of the crisis points for the wiki novel. As soon as the editorial team became aware of the problem, they met using the instant messaging service, Skype. At that point it wasn't clear whether this was a case of deliberately staged drama, an overreaction caused by the overheated atmosphere or something more damaging. One of the team commented that “They are really hav[ing] a wiki war, like in wikipedia - very very serious!” however another noticed that Pabruce had not brought the issue to their attention but had dealt with it himself, causing them to wonder whether they should intervene at all or just ride it out. They had already noted the difficulties between Pabruce and Sentinel68 and Sentinel68 had also been flagged as an individual who seemed far too ready to delete material. Should they consider banning him? Come to that, did he even exist? At least one of the editors suspected that Pabruce and Sentinel68 were one and the same person acting out a drama. In the end the team decided to watch the unfolding events closely but not intervene. If this was a staged performance then banning someone would possibly be playing right into the drama. On the other hand, if Pabruce's real personal details had indeed been posted there was the possibility of the events leading to all manner of distress and accusation. As it turned out, the decision not to intervene at all turned out to be the right one and events settled down again of their own accord.

Pabruce disappeared for a couple of days but soon he was back. On the 15th and 19th of February he made two edits to his and another person's user page and then on February 22nd, he returned to the wiki in earnest creating a new page for a character called Lewis Oswald, and contributing another 665 edits before the wiki closed. After his return his behaviour was much more low key and it is noteworthy that he made around half of the number of the edits after he returned as he did before he left. Clearly the experience of seeing himself re-invented as a character within the story he was himself involved in creating had left its mark.

**Choose your own performance**  
Pabruce was not the only performer in town. Nostrum19 provides another example of dramatic interventions into the wikinovel that massively influenced the novel. As with Pabruce, Nostrum19's first edits were on February 3rd, and consisted of significant contributions to the “Welcome” page where he renamed characters, and removed some of the whimsy that had been edited into the story in order to return the story to a more Noir-based style. Showing complete confidence in his own judgement, he started at line 1 of the story and made a pass through it. At the same time he added comments to K1's user talk page.

*You need to quit strong-arming the story to fit some preconceived notion. You are an ass, and your editing (no butchering) really stinks.*

Unlike Pabruce, Nostrum19 seemed to have a strong belief in a collaborative editing ethos but like Pabruce he was happy to make his views known both in the Talk:Welcome page and in user's pages. Here he berates a user called Djansen for deletions

*I don't like your strong arm tactics. You shouldn't just delete other people's contributions wholesale.*

One of the other frequent contributors in the early days, Kate Fynn, accused Nostrum19 of a similar failing. Writing in Nostrum19's user page on February 5th, Kate turns Nostrum19's words against him in an echo of his own message, much as Pabruce was invented as a character by another user in the endless hall of mirrors which copy-and-paste can produce:

*I don't like your Armstrong tactics. You shouldn't just take of your shirt and flex your bulging muscles just to prove a point.*

After his early edits, Nostrum19 focused on “choose your own...” stories. The idea had first been mooted by a user called Nicholasjh in the Talk:Welcome Page where he suggested that

*I think the Admin should look at making this a choose your own adventure. With the abilities of Wiki, you could even start out picking a Genre, ie. Contemporary fiction, sci fi, fantasy, horror, contemporary fantasy, etc, and the wiki would take you to that book.*

Nicholasjh had created a page called “sci-fi” which had clearly been meant to be a sci-fi choose your own adventure story but instead other users alternated between edits that parodied the formula or simply replaced it with their idea of a sci-fi piece. Nostrum19 found the page and took over, working on quite a complex hyperlinked set of pages and adding in his own interests to do with brain implants and genetic conspiracies. This work inspired a lot of interest and seems to have motivated quite a few contributors to try their hand at the “choose your own...” formula with some of the work becoming quite highly regarded. Kate Pullinger described one such story aimed at women as “brilliant” while another of the team, Toni Le Busque, wrote in the project team's blog that

*I usually have a quick look around the front page and then go straight to where I know I will find something smoother, less violent. Bit like when you go to a club, you have to go through all those ruffians at the front door and find a place up the back somewhere on a sofa with your mates.*

*I find that in the “Choose your own” section.*



Nostrum19 acting as a performer drew both praise and attack, and inspired many pages in the wiki. He also attempted to create a sense of a community by using his user page to draw attention to the work of others as well as himself.

*Hi. I like my writing, but I like collaboration even better, so edit it. I've worked a lot on the Sc-Fi novel, so add to it. please! Here are some other good writers you should check out. I've just stumbled upon some of their stuff and liked what I saw:*  
*User:Random guy, User:Sentinel68, User:Nicholasjh, User:Jhoward*

Pabruce, Nostrum19 et al used the wiki as a stage on which to perform. They may have fallen out with others and had very specific ideas about where to take the wiki novel but they all shared an ethos of improving “A Million Penguins”. Not every performer had such benign intentions.

**YellowBanana - genius, vandal or troll?**  
The problem with YellowBanana was that nobody knew whether to take him seriously. Was this person a vandal to be blocked, a pest to be

ignored or a source of creative play with the wiki? Although by no means the most frequent contributor to the wiki - making 166 edits - he gained significant attention beyond the confines of the wiki due to his “banana-isation” of “A Million Penguins”. YellowBanana made his entrance on February 13th at which point he performed 22 edits to different pages over a period of 25 minutes. The particular target of his ire appears to have been a section on the Welcome Page called “Gestalt:” an attempt at reflecting on the process of writing in the wiki novel. For example, YellowBanana deleted the concluding lines and replaced them with “My long-winded diatribe is over - if you still have the will to live, continue reading..”. Similarly the line “I am one of “the million penguins” and they are we,” had the sentence “I like to talk in a way which sound smeaningful[sic], when I am really saying nothing,” added to the end. YellowBanana titled their edit “(garr.. kill me now!)” to indicate their response to the edited passage.

| Before   | After   |
|--|---|
| You do not know me. “My” name is not attached. It is born of a million syllables and floats like astronauts read on... | My long-winded diatribe is over - if you still have the will to live, continue reading... |

This initial edit is important for what it tells about YellowBanana's response to the wiki; he seems to have seen it as pompous and long-winded and, therefore, set out to challenge this through ridicule. YellowBanana was not, however, a simply destructive force. Over the next 25 minutes he refined the “Gestalt” section through a quite complex set of actions. First he created a new page called “here” and used it to store all the text in Gestalt then he replaced all of the text in Gestalt with the text:

*You do not know me. Unless you do, in which case ignore this. Actually, you are better of ignoring it - if you are really desperate, you can view my long-winded diatribe where I try and sound meaningful here.*

The link goes to the “here” page that YellowBanana had just created. In this case, YellowBanana appears to be trying to remove something that he regarded as bad writing while keeping it available on another page; arguably good wiki practice. However, at the same time as doing this, he was also adding the word “smeg” into instances of “id/ego” and creating a new page called “id/ego/smeg” with nothing but the text “smeg, smeg, smeg!!”

YellowBanana had also spotted that Sentinel68 was a major contributor; indeed Sentinel68 was editing the “Welcome” page at the same time as YellowBanana. So, he edited Sentinel68's user page.

| Before  | After  |
|---|--|
| Hi everyone, my name is sentinel. Here are some principles I am trying to follow 1. as far as possible, try to keep other's work in the text and as intact as possible. | Hi everyone, my name is sentinel. Here are some principles I am trying to follow 1. as far as possible, try to insert the word 'smegma' into the text at random. |

These early edits show YellowBanana to be an extremely competent and confident wiki editor who is being destructive yet being destructive with a purpose. YellowBanana gained his notoriety, however, by replacing emerging motifs in the novel with bananas. It started during his second set of edits to the wiki. From 9:46pm February 13 (GMT) YellowBanana made 26 edits up to 2:20am the next morning and began inserting bananas. First he added a sub-section to a page which was, at that time, section 4 of the “main” novel. Titriling it “Get Bent”, the passage started:

*The banana was yellow and bent. He had expected it to be bent, for most banana were, but it was the way it was bent that was surprising. The banana was bent into the shape of male genitali.*

Over the next few hours, YellowBanana developed this section further and began to insert bananas in places designed to gain maximum attention. Like Pabruce, YellowBanana was engaged in performance that was supposed to draw attention to itself. The problem for the overseeing editorial team was that it wasn't clear whether or not YellowBanana's edits constituted vandalism. In the spirit of the project, Jeremy Ettinghausen blogged about the dilemma, asking

*Should we ban him/her (permanently, or just for a few days?) or celebrate the infusion of fruitly fun into this project? Basically does this gag have apeel, or have you all had a skinfull of bananaman's monkeying about?*

The entry gained 25 responses that on the whole argued for the user not to be banned.

Perhaps somewhat ironically after all the calls to allow him to stay, YellowBanana had only six editing sessions between February 13th to February 19th then disappeared from the wiki not to return until March 5th when he restarted reinserting bananas and banana references.

| Before  | After banana-isation  |
|---|---|
| Carlo's hallucinations were now at fever pitch. Reality and imagination, his writing and his characters were blending into a clump of madness.... | “Tomorrow is here”, he thought to himself, nodding meaningfully. He often thought such deep thoughts after smoking dried banana peel. He checked his stash - he had plenty left. He breathed deeply, letting the banana-scented smoke fill his lungs. He begun to hallucinate, bananans with legs running across his vision, chasing each other, squealing madly. Reality and imagination, his writing and his characters were blending into a clump of madness.... |

He performed two large editing sessions on March 5th and 6th but it is noteworthy that this time other contributors gave as good as they got. High sabotaged YellowBanana's user:talk page whilst Pabruce and Sentinel68 reverted or edited YellowBanana's text as they saw fit. In the end, it could be argued, the crowd co-opted YellowBanana by creating a separate version of the novel - “the banana version” into which most of the banana references could be put.

In many ways YellowBanana subverted and ridiculed their reprisals while, simultaneously, strengthening them. In a measure as close to “official” approval as one could get, the instigator of the project, Jeremy Ettinghausen, rescued YellowBanana's user page from attack by other contributors. YellowBanana had replaced the text on their user page with four ASCII art versions of a yellow banana. On March 5th, BigTony had reverted this piece of artwork only for Ettinghausen to undo the reversion. Perhaps somewhat ironically, Jeremy Ettinghausen ended up saving YellowBanana's ASCII art banana.

#### Sentinel68 - the gardener

With 1,114 edits Sentinel68 was the second most prolific contributor to “A Million Penguins”, this despite the fact that he didn't start editing until February 7th, at which point the wiki novel had already been live for a week. From the time he made his first edit, there was not a day went by where he failed to edit something. Throughout this huge effort he concentrated on one thing: creating order. His first edit was to the talk page for “section 2” where he added the text:

*My first reading of the text of this fascinating project is there seems to be a heap of opening chapters and one or two ending chapters (or is that epilogues). I was thinking it might have been more helpful if, even allowing for twists and irony, that we could build upon each other's earlier chapters and take our cues from what the prior chapter has set up, rather than a heap of new “jumping off points”. I also wonder whether some of the names of characters could be changed to standardise a smaller cast, if that was possible I do not know at this stage.*

One minute later he seems to have realised that he ought to leave a signature and so he edited the page again in order to manually add “sentinel68 aest 12.03am Feb 8, 2007”.

The opening edit exemplifies Sentinel68's interest in the project. In an interview with one of the wiki administrators, Joanna Howard, he writes that to create a collaborative fiction one needs:

- Clear communication of plot and genre (clear forum for conveying of it and arguing/dialoguing).
- One needs to agree to build upon and add to the work of others, not readily remove, (unless clear process and reason to do so, and communicated in foresaid forum). (Howard 2007)

These principles informed both the content he created and the structures he changed. Much of the story that he added, whether or not it survived, is intensely reflective of the struggles he saw in “A Million Penguins” such as this example from this first foray into adding to the story.





*He didn't want to remove any of it. It was all creative, it was all brilliant. yet, he knew his ill-disciplined juxtaposing was like baking a cake with too many ingredients. He had so many ideas that he didn't know which one to follow through to the end.*

It is also noteworthy that when he first started he seems to have been quite unsure of how to use MediaWiki software or the etiquette of wiki authoring. In his first content addition he tries to create a subheading, tentatively calling his addition “Chapter 12.b - The Orson Welles effect” and fails. He also manually added his signature to indicate that he had written the section despite the etiquette that all content in the main pages is meant to be collaborative and unsigned.

His knowledge of and expertise with the wiki improved massively and he appears to have taken his self-appointed role of creating order very seriously. When he is accused of moving around chapters to destroy the flow of the story he writes back in his user talk page:

*I REPEAT, I have done some editing to and re-titling of chapters but basically have kept them in exactly the order that I have found them. Maybe others have moved things around, but I am just working with what i find here and as I said I have not deleted a whole section of someone else's work, and have tried to incorporate others works in some kind of flow.*

Over the period of the wiki novel, the vast majority of Sentinel68's edits were to main pages - 1,060 out of his 1,114 in total. Most of these consisted of editing and tidying and moulding the wikinovel into something he regarded as consistent. For example, he changes a chapter heading on the “Welcome” page from “The Fruit Ball and All” to “Eden Mark II - Is ‘Banana’ the New ‘Apple’” while in a section called “Brain food” he corrects the misspelling of “reveled”.

Sentinel68 was tireless and, given that he was in Australia, his edits often came at times when the wiki was relatively quiet. He did not, however, work behind the scenes. He added a lot of content of his own, particularly focusing on passages which directly or indirectly referenced the issues involved with mass collaboration. For example, he was particularly interested in the notion of the gestalt, creating a page of that name three days after he first started and then developing the theme on the welcome page by changing the preface name from “communion” to “gestalt” and then modifying the text “I'm hoping for the best” to “I am more than hoping for the best, the results will truly be an extraordinary ‘organic’ communion; bigger than the sum of its individual members”. This Gestalt section would draw the ire of YellowBanana.

It is perhaps best to return to the metaphor of gardening to describe Sentinel68's edits. The gardening metaphor is widespread in discussion about wiki behaviour as a way of understanding how wikis expand or fail. Although a gardener may create ‘content’ their main activity consists of pruning, replanting, re-ordering and so on. A gardener is active and present in the wiki ‘garden’ not just through editing content but through their interactions with others. Although the majority of Sentinel68's edits were to the content of the wiki, he also spent a lot of time editing user pages: both his and others'. He used those edits to praise or complain. So for example, he creates a user page for Yodelero where he writes, “I love your afterword, it is brilliant, cheerio sentinel68”. Conversely, he created a page for the user BacktoFront where he wrote “I don't know what your obsession with undergarments is but it is neither funny, relevant or helpful”. Both of these interventions are designed to influence the behaviour on the wiki; Sentinel68's gardening was not just about modifying content but attempting to influence what content got added.

What is most noticeable about Sentinel68's edits is that he only ever made three contributions to the talk pages for the wiki and two of those were the first two edits he ever made. Instead he focused all his communication with other wiki writers through their user pages and associated talk pages. In this way he is acting in a deliberately non-performative manner in that his interventions are not in commonly edited centres of discussion but in the quiet byways of the wiki's user pages. His interventions were routinely personal rather than public.

#### Garden gnomes

It is possible to find users who worked as WikiGnomes: correcting things quietly in the background. No frequent editor acted in this way but many made just a few edits. For example, one user called Monkeyelf79 performed just two edits, both in the sci-fi section of the wiki novel, both of which were simple bits of correction such as those excerpts shown below where the user corrects the tense.

#### WikiGnome

A WikiGnome works behind the scenes to tie up little loose ends, adding ISBNs of books that people mention, tracking down the authorship of “someone once said” quotes, correcting BrokenLinks, fixing BrokenWhitespace, answering AnswerMes, tirelessly replacing ChatMode with content, fixing misspellings, and, when appropriate, making ordinary words into WordsSmashedTogetherLikeSo. (<http://c2.com/cgi/wiki?WikiGnome>)

Unlike gardeners, WikiGnomes rarely make major changes to the structure of the wiki consequently their actions are often not noticed. Although there were no frequent editors who acted purely as WikiGnomes there were a large number of infrequent users who, when they edited a page, acted as WikiGnomes by correcting a small mistake or bringing an issue to the administrators' attention.

| Before   | After   |
|--|---|
| "I think we should blown them to hell," you replied  | "I think we should blow them to hell," you replied.   |
| "Gladly," you say, as you eagerly swung around in your chair, pressed the red "fire" button, and watched as the Vangorn personnel carrier broke up in space, killing all 150 men aboard. | "Gladly," you said, as you eagerly swung around in your chair, pressed the red "fire" button, and watched as the Vangorn personnel carrier broke up in space, killing all 150 men aboard. |

There were 570 users who edited the wiki on just one or two occasions and of these, it is possible to identify around 380 users whose edits were small, simple corrections. The wiki novel may not have been written by a large community but it was quietly edited by a large number of WikiGnomes who fixed just one or two things each.

Comparing the different types of contributor behaviour helps show that activities such as “gardening” and “performing” and “gnoming” exist on something of a continuum. The key determiners tend to be the style of contribution and the location of it. The performers such as Pabruce and Nostrum19 jumped straight into the most popular areas and started to edit while also contributing to the main talk pages. Gardeners such as Sentinel68 focused on corrections and tended to contribute to the user talk rather than the main talk pages while gnomes tended only to make corrections and rarely, if ever, contributed to any sort of talk page. Between them, these types of activities were responsible for the wiki growing at a tremendous rate. Even the vandals contributed through their more problematic interventions.

#### The Wiki - a party in the park?

The dominant metaphor for wikis in general has been that of the “garden”. The notion was first suggested by Ward Cunningham and has become ubiquitous in the work of people like Stewart Mader, whose book, WikiPatterns, derived from the enormously influential Wikipatterns website, features a pot of tufted greenery on the cover and offers to help “plant and grow a successful wiki” (2008). The basic premise is that a wiki grows from the bottom up and structure emerges over time, something along the lines of cultivating wild lands. In this metaphor, users are gardeners who are responsible for seeding, organising, weeding and watering the material in the wiki. The key element of this understanding is the use of linking to connect the different pages of the wiki together so that the ‘garden’ flourishes. A brief look at wikis such as Wikipedia, WikiWikiWeb or Wikipatterns will show the way in which each page is linked to many other pages, allowing users to freely follow their chosen train of thought. Failure to create these links between pages leads to wastelands of unlinked pages or walled gardens of pages that only link to each other and are not integrated with the rest of the wiki.

The question then is, can “A Million Penguins” be understood in light of the garden metaphor or is something different required? In the first instance, the numbers have a story to tell.

An examination of the wiki shows that 366 of the nearly 500 content pages don't contain any links, implying that approximately 75% of all these pages do not link to any other pages in the site. In addition there are 150 content pages that are not linked to by any other page. Taken together, it becomes clear that the majority of the content pages in “A Million Penguins” are not linked to each other. Most of the pages in “A Million Penguins” should be consider akin to wastelands: undeveloped, unlinked fragments of content.

Where there are ‘gardens’ in the wiki, they appear to be walled. There are at least seven nascent novels in “A Million Penguins” most of which do not

connect to each other. There is the “main” novel, various versions of it, including the “banana version” and several “choose your own adventure” style stories. Although the pages around the main novel tend to be the most viewed and most edited, the other novels often have clusters of frequently viewed pages. There are also little pockets of activities that fit the description of a walled garden.

#### A Million Walled Gardens

The existence of so many unintegrated elements in “A Million Penguins” may well be why the wiki novel is often claimed to fail as literature. For example, in “Emily's LitCrit Blog” the author writes that “[i]t felt like 21 short stories with all the same character names, not one cohesive piece of literature”. Similarly, blogging at the Institute for the Future of the Book, Ben Vershbow muses “[h]ow ironic it would be if each user ended up just creating their own page and writing the novel they wanted to write -- alone”. Comments from observers have tended to focus on the wiki novel as a “failure” and ‘proof’ that collaborative authoring isn't possible. It is arguable, however, that part of the appeal of “A Million Penguins” is the existence of these walled gardens. In Penguin's Blog, Jon Elek writes

*Do not attempt to read this as a traditional novel. Swim around in it a little, see what you like, read until you get bored. I find I can read in about 10 minute stints, which I reckon is pretty good considering what it's like. But then again, I can't sit down and read a lot of well known experimental writing for much more than that anyway.*

Indeed, during the authoring some of the contributors started to prize the quiet, out of the way places that would not be consistently edited, vandalised or otherwise interfered with. For example, in Talk:Welcome one contributor writes:

*Partner sought: is there anyone out there who wants to tag team on the Fantasy section of Write Your Own Adventure. No-one is touching it - and it seems like a quiet place to get some solid writing done. Look forward to replies. (Tim, Australia)*

This use of walled gardens as somewhere that real work could get done was also echoed by the editorial team. Writing in the team blog, Kate Pullinger notes that...

*there's a really brilliant choose-your-own-adventure story aimed at women shaping up in the wiki now. I can't decide whether or not to post the url for it here, as I'd hate to see it defaced in any way - although real contributions are most encouraged. In a way, this is one of the most interesting aspects of the wiki novel at the moment - the secret corners where people are making really interesting collaborative works. But is also throws up a dilemma - do we publicise these finds and risk seeing them damaged, or not?*

It appears that the walled gardens served a function in “A Million Penguins” rather than being a dysfunctional part of the wiki. The metaphors by which people talked about them, referring to them as ‘secret’ or ‘quiet’ also imply a rather different understanding of the wiki. Instead of characterising “A Million Penguins” as a failed garden it makes more sense to think of it as something akin to a carnival with various stages for performance. One stage was the main stage where the “main” novel and all the surrounding activities occurred. Other stages were more out of the way, sometimes even hidden. One of the editorial team noticed this at an early stage but never developed her ideas when she wrote that the wiki novel reminded her of a party that had gone on too long.

#### A Million Numbers

As of March 7th, when the wiki closed, at least 75,000 different people had viewed the site. Of those, 1,476 people had registered as users of the wiki. It is useful therefore to consider a differentiation between an audience who viewed the wiki but never registered and a crowd of roughly 1,500 who registered and had the potential to contribute. This crowd can be conceived of as present in the wiki even though not all members of the crowd actually contributed anything.

Indeed, most of those who registered for the wiki either never contributed or contributed on just one occasion. Although there were over 11,000 edits made, the majority of those edits were performed by a relatively small number of contributors. Pabruce made 1,780 edits while Sentinel68 performed 1,144 edits. These two performed 2,924 edits between them: over 25% of all edits.

Given that so many edits were done by so few, it is legitimate to ask whether “A Million Penguins” follows a pattern known as the “90-9-1 theory” (Nielsen 2006). Roughly put, the theory is that 90% of all users of any specific Internet resource are “lurkers” who read but never contribute, 9% are occasional contributors, and 1% are extremely frequent contributors. If this ratio applied to “A Million Penguins” we would expect to find that roughly 1,320 members of the crowd had never contributed, 130 had contributed infrequently and up to 15 had been very frequent contributors. The figures are more complex than that though.

The user pages show that roughly 55% of registered users had never edited the wiki (814). Of those that had edited the wiki, however, most (570) had done this on just one occasion. Not counting the seven members of the editorial team, the remainder of the registered users (85) had edited the wiki on multiple occasions. As a participation ratio this appears to be closer to 55-40-05. However, if we group those who had contributed just once with those who never contributed and look into more detail at those frequent contributors then something more akin to the 90-9-1 theory emerges. Of the 85 who contributed on multiple different occasions, most (67) had contributed on 5 occasions or fewer, 18 had contributed more often and two had contributed over 1,000 edits each.

The numbers imply that rather than thinking of an non-interactive crowd of “lurkers” forming 90% of the participants, we can conceive of the registered users as a crowd of people occasionally reacting to a number of performers some of whom are recognised as star performers. This suggests that it would be appropriate to depict of “A Million Penguins” as somewhat like a carnival where the audience reacts to various performances while the performers react to each other and the audience. It is possible that members of the audience may briefly become performers as they interact and performers themselves may join the audience in a fluid interchange of roles.

The structure of the wiki itself is the embodiment of the reversal of a successful wiki pattern. The vast number of unlinked pages and presence of multiple “walled gardens” as revealed through linking patterns would normally be thought of as dysfunctional. In a carnival setting, though, they make sense as small knots of activity, as performances in their own settings within the larger setting. The numbers and structure of the wiki, both in its final form and as revealed through its history pages show a pattern of behaviour that may be best described as carnivalesque. In this respect “A Million Penguins” can be best understood not as an “inevitable” or “glorious” failure of the community to write a novel but as something wholly different, something akin to a carnival.

#### A Carnival of Penguins

Examining the behaviour of the contributors and the structure of the resulting wiki leads to a characterisation of “A Million Penguins” as a specific type of performance: a carnival. Writing in Rabelais and His World, the influential philosopher Mikhail Bakhtin associated the notion of carnival with subversion and reversal. At a carnival the ordinary people could poke fun at authority and play at overturning the power relationships in their society. Because a carnival was a “time out of time” then all who partook were equal and all were members of a collective. At the same time, carnival was an event that was fundamentally playful because it was known to be bounded; the reversals that took place always ended. For the duration of a carnival, however, the fundamental action was laughter, a complex, “ambivalent” laughter which is “gay, triumphant and at the same time mocking, deriding. It asserts and denies, it buries and revives. Such is the laughter of carnival” (Bakhtin 1968: 11-12).

There are two reversals exemplified in “A Million Penguins”. The first type is the reversal of the author-publishing relationship through the use of a wiki. By setting up a wiki which anyone could edit under the official imprimatur of Penguin Books, the company set up a carnival relationship with the potential authors. The second reversal was that of wiki norms. Much of “A Million Penguins” is grounded in wiki norms but on the whole these norms have been reversed to produce a wiki that is most unlike a wiki. These reversals can be demonstrated both through looking at some of the statistics of the wiki's use as well as the traces of behaviour in the wiki novel.

There appear to be two main elements that resulted in the carnivalesque nature of “A Million Penguins”. The first was the presence of Penguin Books as an authority within the context of a wiki. Penguin's first blog entry introducing “A Million Penguins” asked “...most importantly, can writers really leave their egos at the door?” implying that the key issue might be the need for writers to assert authorship while participating. It





seems likely, however, that the most important factor determining the participation of the writers was the presence of one of the world's most influential fiction publishing businesses. It was clear that some of the individuals hoped to be noticed by Penguin Books. The second key element was the bounded duration of the project. A carnival is only a carnival because it has an endpoint. During the period of the carnival the normal rules are suspended or reversed.

When Penguin Books set up "A Million Penguins" they wondered if the normal 'rules' of authoring would be reversed. What actually seem to have been reversed are the normal rules of publishing and the relationship between the authors and the publisher. Every unvarnished, unfinished, ephemeral thought, edit and scribbling could be instantly published with Penguin Books' masthead attached to it. So it was.

The content of the wiki novel also indicates the carnivalesque nature of the contributions. Bakhtin focuses on the "grotesque" nature of carnival, the way in which the celebrants mark the overturning of the normal order through crude, bodily humour. Holquist states that for Bakhtin, the folk who participate in carnival are "blasphemous rather than adoring, cunning rather than intelligent; they are coarse, dirty and rampantly physical, reveling [sic] in oceans of strong drink, poods [sic] of sausage, and endless coupling of bodies" (1984: xix). Bakhtin celebrated the disorder of the folk, celebrated not only that they farted but enjoyed doing so. If one reads the wiki novel as celebration of excess and grotesque rather than a crowdsourced novel it makes sense in its own terms.

Not everyone, however, approves of carnival and most in the literary establishment appear to have disapproved to some extent or other of "A Million Penguins". Fay Weldon is said to have described it as "great fun" and "writing without responsibility". Those outside of the literary establishment also consisted of many who disapproved of the revelry; this blog entry by Glen Farrelly is particularly revealing

*With such a promising start I continued on, but it lost me after the first few sections in its meandering pointlessness and alcohol infatuation (even for me). The wisdom of crowds thus results in lots of descriptions of booze and drugs - surely the inevitable fart jokes will follow.... Cool experiment. Just hope our species can resist the lure of fart jokes.*

James Pressley, writing on Bloomberg said of the wiki novel "[t]he first chapter is predictably horrible -- or was when I logged onto <http://www.amillionpenguins.com> early today. ... When I checked 30 minutes later, the opening had changed. It was getting worse, not better".

The commentators who responded favourably to it usually seem to have done so because of its carnivalesque nature, though not necessarily putting it in those terms. Brock Read, writing in The Chronicle noted that "Nabokov it ain't, but the Wiki novel should be fun to keep track of, thanks to fast-paced editing like that," while a writer on Ars Technica stated "[i]t's all in good fun, of course, and is likely to irritate only those who take it seriously".

It was the very vitality of "A Million Penguins" that both appalled and intrigued commentators and contributors alike. The editorial team were initially at the point of despair after the first few days yet, once the pace of editing started to slow, there is almost a note of wistfulness that creeps into their discussion. One email topic on the editors' private discussion list is "time for reflection - is everything slowing down? is that a Good Thing?" One editor responded "[i]ndeed it is slowing down and I'm partly relieved and partly wish it were busier". It is possible to consider the pace of editing as an expression of excess. Carnival is all about noise and spectacle in excess as a reversal of the normal order that favours peace and quiet. In "A Million Penguins" this translates into the spectacle of the "Welcome" page changing almost minute by minute, of character names shifting and changing and mutating. It is this noisy, spectacular reversal of all the established norms of writing that both gave "A Million Penguins" its astonishing excitement and attracted so many complaints about its artistic value.

Considering "A Million Penguins" as a form of carnival opens up ways of understanding the wiki novel that goes beyond the somewhat simplistic characterisation of it as "shit". The originators of the project created, inadvertently, a possibility for carnival and any carnival reflects on the world in which it was situated by reversing the norms and symbols of its surroundings. Writing about such reversals, Barabara Babcock states that, "Symbolic inversion may be broadly defined as any act of expressive behaviour which inverts, contradicts, abrogates, or in some fashion

presents an alternative to commonly held cultural codes, values and norms be they linguistic, literary or artistic, religious, or social and political" (1973: 14).

This interpretation of "A Million Penguins" also explains why the initial question of whether or not a community could write a novel turned out to be the wrong question: something acknowledged by Jon Elek, the literary editor for the project. There was no community built around "A Million Penguins" because it was not a setting in which community could form. A 'crowd' certainly gathered around it and some users seem to have created small, ad-hoc groups of interest in bits of the wiki novel but there was no over-arching sense of communal construction.

This approach also helps explain the role that notions such as "co-creation" and "crowdsourcing" played in the wiki novel. Writing in The Wisdom of the Crowds, James Surowiecki claims that "groups are remarkably intelligent, and are often smarter than the smartest people in them" (2004: xiii). His analysis of the way that a "crowd" can aggregate information in order to arrive at solutions has underpinned research into co-creation a method by which creative collaboration can occur. Similarly, theorists of online culture such as Charles Leadbetter and Clay Shirky argue that mass-participation in cultural and business activities opens up new modes of production and empowers people in new types of ways. "A Million Penguins" is a carnivalesque, which is to say somewhat rude, response to these notions. As with any carnival, however, it also re-affirms the reality in which it exists. The amount of work that went into "A Million Penguins" over a short period of time is staggering and indicates the potential for this type of collaboration.

New media critic, Ben Vershbow claimed that a wiki was the wrong tool for collaborative fiction authoring:

*The problem with A Million Penguins in a nutshell is that the concept of a "wiki-novel" is an oxymoron. A novel is probably as un-collaborative a literary form as you can get, while a wiki is inherently collaborative. Wikipedia works because encyclopedias were always in a sense collective works -- distillations of collective knowledge -- so the wiki was the right tool for reinventing that form. Here that tool is misapplied.*

To a certain extent this analysis of "A Million Penguins" corroborates his view because one thing that the wiki novel most definitely isn't is a novel. It also showed very little sign of collaborative work; the content may have been generated by many people yet, with occasional exceptions, the users rarely actively collaborated. Although final product is not one coherent novel, it does contain multiple versions and variants of plot lines and characters including parodic "banana-ised" versions. In addition there are nine "choose your own adventure" stories and uncountable fragments of plots, characters and ideas. The interplay between these pages seems more akin to oral folklore with multiple versions of the same story existing at the same time.

The folkloric multiple versions, some deliberately playful, some abandoned, some existing within a walled garden of connected pages can be seen as the "Long Tail" of the wiki. It is frequently asserted that the real value of user-generated content online comes from the millions of pages that are relatively unvisited (Anderson 2006). Commentators and contributors often found that the most interesting parts of the wiki novel were those that were hidden away from the central stage. Multiple unlinked pages are usually considered to be a problem for wikis but in "A Million Penguins" the reverse appears to be the case, providing yet one more example of how "A Million Penguins" turns wiki lore on its head.

#### So - did a community write a novel?

Brock Read, blogging in the Chronicle of Higher Education, noted that the text was changing even as he was writing a post about "A Million Penguins", causing him to add a footnote:

*Update: Within minutes, one of the aforementioned passages - "the guys entered a small coffee shop in Boulder, Colorado" - had already been edited. For the time being, it's "two young muscular anonymous american proletarian factory workers, looking like they had walked straight off a Socialist realist propaganda poster," stopping in for a coffee.*

"A Million Penguins" contains examples of both the strengths and the weaknesses of large-scale online projects. Because it is highly likely to be seen as something that is out of the norm such a venture may be treated more as an opportunity for play and riotous behaviour than as serious collaborative work. Indeed, anyone who has engaged with online

communities in the last two decades will recognise the tensions involved in keeping interest levels high enough to encourage participation without the community becoming so active that there is no hope of maintaining control. A relaxed approach which allows space and time for such activities may strengthen and facilitate successful co-creation communities.

This report has, necessarily, only focused on a small number of the topics that emerged from the research and it is hoped that it can point towards future studies of wiki behaviour. In particular, it is possible that applying a "transliteracy" perspective may help illuminate some of the issues surrounding competence in "A Million Penguins". Sue Thomas defines "transliteracy" as "the ability to read, write and interact across a range of platforms, tools and media from signing and orality through handwriting, print, TV, radio and film, to digital social networks" (2007). It is notable that many of the contributors to "A Million Penguins" struggled with several unfamiliar literacies: how to write a novel in a wiki form, how to actually use the wiki, what to edit and how to edit the text of others, not to mention the difficulties of knowing how to actually behave in the wiki's peculiar social environment. Sentinel68 struggled to understand how to use MediaWiki's automatic signature and when he should use his own.

The editing patterns of some of the users show them frequently making one small change then, a few minutes later, adding another: as if they were testing to see it how it worked. It wasn't just the contributors who struggled to deal with this. The very act of imagining the project in the first place was an experiment in what might happen when you try to transpose the act of writing a novel into a wiki, and vague hopes that it might produce something traditionally publishable were abandoned within hours of the wiki hitting the wires. Throughout the whole experiment the Penguin/DMU team were engaged in a constant quest to figure out what it was that they had just done, and this report itself represents only a few first steps in understanding what may have happened to literature, if anything, during the month of February 2007.

Certainly, some of the participants in the project did attempt to 'write a novel' but it remains unclear as to whether they succeeded. What today appears not to be a novel as we know it may in time come to be seen as one, just as work once judged not to be poetry is often later brought into the critical fold. But for the moment at least the answer to whether or not a community can write a novel appears to be 'not like this'. Our research has shown that "A Million Penguins" is something other than a novel and, thereby, opened up new questions and avenues for exploration. It has treated the final product not as a variation of a printed novel or something which could be turned into one, but as type of performance. The contributors did not form a community, rather they spontaneously organised themselves into a diverse, riotous assembly. We have demonstrated that the wiki novel experiment was the wrong way to try to answer the question of whether a community could write a novel, but as an adventure in exploring new forms of publishing, authoring and collaboration it was, ground-breaking and exciting. The final product itself, now frozen in time, is more akin to something produced by the wild, untrammelled creativity of the folk imagination. The contributors to "A Million Penguins", like the ordinary folk of Bakhtin's carnivals, have produced something excessive. It is rude, chaotic, grotesque, sporadically brilliant, anti-authoritarian and, in places, devastatingly funny. As a cultural text it is unique, and it demonstrates the tremendous potential of this form to provide a stimulating social setting for writing, editing and publishing. The contributors may not have written one single novel but they did create something quite remarkable, an outstanding body of work that can be found both in the main sections as well as through the dramas and conversations lacing the "backstage" pages. And they had a damned good time while doing so. As the user Crtrue writes:

*Hi hi hi hi hi!*

*Seriously. This is going to fail horribly. It's still fun.*

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A full version of this research publication can be downloaded from <http://www.ioct.dmu.ac.uk/projects/amillionpenguinsreport.pdf>

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## The Reactive Colours Project: Taking an Embodied Approach to Information Communication Technologies, Creativity and Special Education

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### Abstract

This paper will present practical insights and theoretical perspectives in order to offer an approach to Information Communication Technology (ICT) that is creative and expressive. Drawing on the outcomes of the Reactive Colours research, I will highlight how the project exploited kinesthetic engagement and embodied interaction to promote meaningful and transferable learning experiences for even the most anxious of young children on the autism spectrum. The project identified that relaxing, physical and perceptual play experiences with digital technologies can enhance social communication when children are given the opportunity to demonstrate their interests through action. New developments of the project will investigate the potential of mobile and networked technologies to motivate and facilitate non-verbal forms of self-expression. In relation to this, future research will specifically consider the effectiveness of embodied interaction to encourage creative thinking and imagination with emphasis on synthesis and transfer, aspects of the creative process that are known to be particularly difficult for this highly individual group, and the need to discover effective mechanisms to evaluate learning that is tacit and experiential.

### Keywords

Information Communication Technology (ICT), creativity, kinesthetic, embodied interaction, synthesis, transfer, autism spectrum disorders (ASDs), transition.

### Introduction

The Reactive Colours project identified through both empirical and exploratory methods that certain fundamental aspects of social interaction and communication, two of the 'triad of impairments' that contribute to the diagnosis of Autism Spectrum Disorders, (Wing, 1996), could be promoted in young children with ASDs when learning environments are free from anxiety. New research prompted by these findings will evaluate whether playfulness, whereby goals and intentions are discovered through experimentation and emergent interest, can encourage creativity and flexible thinking, which makes up the third of Wing's (1996) diagnostic criteria.

This paper will describe how the physical and perceptual attributes of a range of technologies can be harnessed to encourage young children with Autism Spectrum Disorders (ASDs) to playfully express their interests when the level of cognitive processing required to interpret instructions and perform a task is reduced. This notion will be explained with reference to the Reactive Colours project and the close involvement of children on the spectrum and teaching staff in the design process. By modelling the design on the highly individual capabilities and behaviours of a small group of children it has been possible to design a software application that encourages social interaction and creativity through the act of being playful (Keay-Bright, 2007a). I propose here that when there is a focus on embodied interaction rather than the necessity to gain explicit skills that are maintained and measured through task, the unique individual attributes of ICT environments be can exploited as "transitional objects" (Winnicott, 1982) to enable the positive aspects of experiences, that children discover through kinesthetic engagement, to be transferred across subjects and settings. These aspects of generalisation that are known to be particularly problematic for autistic children

### Information Communication Technologies & Autism Spectrum Disorders

National Curriculum Teaching requirements on the use of ICT across the curriculum state "pupils should be given opportunities to apply and develop their ICT capability through the use of ICT tools to support their learning in all subjects" (DFEE, 1999:39). The emphasis within these frameworks is biased towards analytical ability and the use of the computer as a tool to increase critical thinking and problem solving. Even though educational computing is moving beyond the physical confines of the desktop with the widespread use of interactive whiteboards and mobile devices, task-based, operational interaction tends to dominate the

user experience and the unique kinesthetic features of ICT that could allow for more individually expressive creative experiences have yet to be fully realised. An extensive review of the literature on new technologies and creativity identified the potential of technologies to make a "distinctive contribution to creative activities, that is, to enable users to do things that could not be done effectively using other tools" (Loveless, 2002, p13). In these contexts it is the acquisition of skill with ICT that is understood to be the most effective method of supporting the creative process of being in a relationship with oneself, other people and the physical environment (Craft 2000).

### Creativity and the child with an ASD

From infancy, children naturally develop awareness of self through the exploration of objects in early sensory-motor play. As they mature they begin to locate these experiences imaginatively in social and creative contexts through functional and symbolic play, which directly assists them understanding the world and their relationship to it (Piaget, 1945; Vygotsky, 1978). Children with ASD, however, are understood have difficulties with these conceptual forms of social play, and their interaction with toys and everyday objects often remain at a sensory level (Beyer & Gammeltoft, 2000, Bogdashina, 2003). Whilst children with ASD will vary greatly in their capacity for creative thinking, they will generally need support in following areas:

- Joining in with others in pretend play situations;
- Transferring learning to new situations or problem solving outside cued rote responses;
- Broadening interests beyond the typical narrow, often obsessive or compulsive ones that dominate thinking and behaviour;
- Making connections and seeing relationships between things;
- Abstracting meaning from experience. (Jordan, 2003; Jones, 2002; Jordan & Libby, 1997)

Most interventions tend to be heavily structured, setting specific targets, with the purpose of avoiding confusion and stress. However, in these highly organised situations, children cannot reveal interests that do not coincide with the specific and predicted outcomes of the activity (Sherratt, 2002).

For this reason it is important to find an approach to teaching children with ASD in environments that enable creative thought to arise through emergent interests rather than activities that have little social significance or symbolic meaning (Hobson, 2002). Technologies that encourage discovery through physical manipulation and embodied interaction can therefore offer children a valuable starting point for creative experiences and activities that focus on sensory manipulation may be easier to cope with and developmentally more appropriate than cognitively demanding tasks (Healy, 1998).

### The Reactive Colours project

The Reactive Colours project, based at Cardiff School of Art and Design, was awarded funding by the National Endowment for Science, Technology and the Arts (NESTA) in 2005. The funding supported two years of participatory development, which involved teaching staff and children with ASD aged between four and seven years, at a school for children with special educational needs in Wales, UK. The overall aim of the project has been to encourage children to playfully engage with technology in a variety of settings, both at home and at school and to evaluate whether an explorative, rather than a directly purposeful environment, can reduce the anxiety that inhibits social communication and imaginative thinking for children on the autism spectrum. The outcomes of the project have included the ReactTicks software, Reactive Colours website ([www.reactivecolours.org](http://www.reactivecolours.org)), and the ReactTicks Creativity Box.

### The ReactTicks Software

For most children learning will take place in an environment that encompasses individuals and groups taking part in a range of problem solving activities. The physical environment, resources, technologies and space, as well as other people are constituents of a system that seeks to provide continuity and an appropriate degree of challenge (Loi, 2006). However, for children with ASD, the unpredictable events and incidental changes that are likely to occur in these environments can be alarming and often lead to challenging behaviours that can upset the child, other children and teaching staff (Moyes, 2002). These behaviours are barriers to creative thinking, social interaction, and ultimately inclusion. For this reason, I propose that ICT environments, designed to support the needs of children with learning difficulties, should recognise the need for experiences that could assist them in coping with transition. It is in the context of providing a positive experience, associated with a favourite object, that transfer across subjects and settings may occur. In

accordance with Winnicott's (1982) theory of the 'transitional object', to cope with the anxiety that occurs during times of change children need repetition, continuity, sound, smell or touch, the experience of which is often linked to a favourite object.

The ReactTicks software has been designed to run on technology systems that are in use in most mainstream and special education schools. Broadly speaking, these are desktop, tangible (for example touch screen and interactive whiteboard), mobile and networked technologies. Most importantly in relation to synthesis and transfer, is the opportunity to play with ReactTicks in any input mode, for example, mouse, keyboard, microphone, touchscreen, interactive whiteboard or a range of assistive technologies. The key point is that the affordances of each modality, that is the physical and perceptual properties of the object that suggest how it may be used (Norman, 1990), will invite an experience that can be transferred. Some ReactTicks have features that are similar regardless of input, whilst others will have a response that is specifically related to the mode of input. The software is designed to subtly trigger actions such as repetition, smoothing, circling, pressing, tapping, and, in the case of the interactive whiteboard, stretching and reaching, and has the playful effect of dynamically responding to these actions via the computer screen. For the child, seeing small recurring actions and exaggerated gestures mirrored has the potential to not only increase awareness of self, but also enable others to share the experience, through emerging interest rather than command. Bodily actions, rhythms and patterns that typically dominate pre-verbal forms of communication can become the tools for play in a safe, creative digital playground. ReactTicks avoid metaphorical or graphical representations in favour of abstract forms and colour. They are designed to make use of intrinsically captivating shapes and sounds that can be freely explored when there is no preset function or goal to meet. Using non-representational forms enables children to feel as though they are in control of their movements as they interact directly with the physical surface rather than a graphical or metaphorical representation of an object (Fishkin, 2004). The relationship between the input device and digital output is less about the analytical processes fostered through the interpretation and control and manipulation of information, and more about synthetic ability facilitated through sensory stimulation and reflection. In accordance with Gibson's (1979) theory of 'direct perception', the design uses the properties of objects in order to enable children to use sensorimotor knowledge to construct representational meanings of the world that surrounds them, they are therefore directly sensitive to the world and its capacity for action.

### The role of "affordances" in ReactTicks

The physical design of a mouse suggests it could be picked up and used easily for smoothing, circling and tapping. Usually, when it is used to perform a task, the link to function is arbitrary and bears no relation to the digital environment, the sequences of actions that lead to pointing, clicking, scrolling and dragging have to be understood through understanding metaphor and interface instruction (Dourish, 2001). Mouse ReactTicks are mapped to the device's physical properties leading directly to a visual and auditory response on screen, there are no instructional devices that force pointing, clicking, scrolling and dragging - the design of the software will naturally trigger these behaviours as the child explores the screen. A keyboard has physical properties that promote tapping, pressing, repetition and rhythmic patterns of movement. Keyboard ReactTicks elicit responses on the screen that match the spatial organisation of the keys on the keyboard, increasing pressure and repeating actions can create an array of patterns, mirroring the tapping of fingers in a visually dynamic manner. A microphone can be touched, used with the voice or another instrument, in order to stimulate a response on screen. In response to volume of sound microphone ReactTicks reward the child with patterns that vary in intensity of colour, scale and proximity. An interactive whiteboard usually consists of a computer connected to a projector, which simultaneously projects onto a large-scale touch or stylus sensitive whiteboard. Interactive whiteboard ReactTicks trigger gross motor actions such as stretching, reaching and jumping, encouraging the child to use the whole of the surface. The scale and proximity of the interactive whiteboard, coupled with full body movements, has the added benefit of prompting children to stand back and observe their actions and to move from repetitive behaviours to more self-directed and intentional ones.

Figure 1: Playing with ReactTicks at the Interactive Whiteboard



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### The Reactive Colours Website

Recent research on the role that people with learning difficulties have to play both as the subjects of research and as researchers themselves calls for innovative methods that enable and empower all participants to have a voice in interventions that are likely to impact on their daily lives (Owens, 2007). The Reactive Colours website addressed this issue by introducing a level of participation that would be missed had the project solely relied on traditional methods. The rapid iteration and release on the site of ReactTicks software prototypes through a 'suck it and see' process, gave online users the opportunity to experiment with the software and give feedback through a variety of methods. The site has a blog, direct email and an online evaluation form. Each method provided sufficient feedback to justify it as a valuable source of evaluation. Significantly, the openness of the project prompted users to share their experiences with others. For the young children using the software in trials at school, the web site had the added benefit of extending the learning experience to the home and other environments.

Figure 2 ReactTicks Online Gallery



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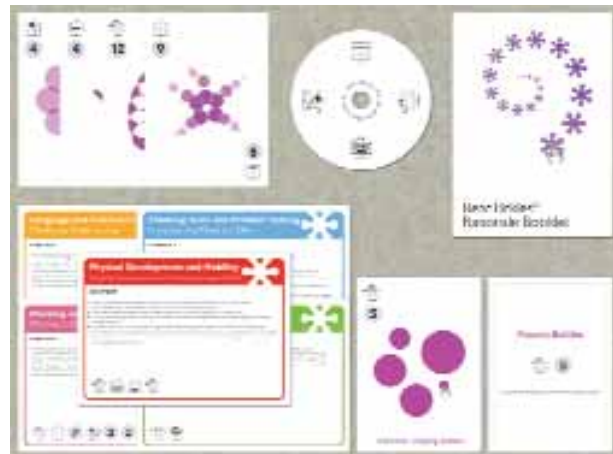
### The ReactTicks Creativity Box

The goal to promote meaningful and transferable learning experiences meant that educational objectives had to be implicitly embedded within the experience rather than explicitly and intentionally designed to meet 'learning outcomes'. In response to this, expert practitioners from the University of Birmingham School of Education, WebAutism course, a unique undergraduate programme offering specialist training and education for practitioners and parents who care for and work with people with autism spectrum disorders, joined the design team to develop the ReactTicks Creativity Box, a bank of easy to use printed materials designed to provide structure and ideas for how ReactTicks can meet ey learning objectives in the UK curriculum. The aim was to ensure that the experience was pedagogically anchored on current practice whilst at the same time encouraging a positive, playful, inclusive, mutual experience for all learners. Following a successful trial period which involved schools throughout the UK, the ReactTicks Creativity Box, which also includes an extended, fully customisable version of the software, is now commercially available and distributed by Tag Learning.





Figure 3 The ReactTicks Creativity Box



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### Evaluation

The design and development phase of the project investigated whether or not embodied interaction afforded through the ReactTicks software could assist children with ASD in experiencing certain prerequisites for social communication, that is waiting and turn-taking. Consistently encouraging results have been verified through qualitative and empirical studies (Keay-Bright, 2007b). Future research will undertake an extensive assessment of existing metrics that are designed to measure creativity and imaginative thinking. The appropriateness of these metrics will be considered in order to discover a methodology that will most effectively enable an evaluation of learning that is tacit and experiential. It is proposed to use a "case study" methodology in order that the atypical and idiosyncratic expressions of self can be identified and supported, and to consider how best to improve ICT environments of the future to ensure that they can easily adapt to individual capabilities and assist transition.

### New Technological Developments - ReactTicks Global

Just as the Reactive Colours research explicitly exploited the affordances of everyday desktop and tangible ICT environments, new developments of the project will investigate the very specialised experiences afforded by handheld devices. We are naming this phase of the project ReactTicks Global.

An initial proposal to migrate some of the salient features of ReactTicks to mobile devices won an award for "Innovative New Forms of Socially Responsive Media Across Multiple Platforms" in the Content 360 competition at MipTV in Cannes, France, in 2007. This led to a contract to develop a concept with promotional support from the National Film Board of Canada. ReactTicks Global will further investigate existing practices with creativity with ICT, and will consider the effectiveness of mobile and networked technologies to mediate self-expression through the properties of mobile devices. For example, users might create ReactTicks using the numerical keypad or camera and add dynamic movements. In addition, it is proposed to maximise on the inherent connectivity of devices to design a generative map of user "art". In contrast with the current Reactive Colours website which hosts ReactTicks in a "static" gallery, the idea for ReactTicks Global is to develop a more responsive environment for users to submit their creations and connect to ReactTicks created by others. This phase of the research will also present an opportunity to extend participation in research and development to a wider community of autistic users.

### Conclusion

In this paper I described an approach to ICT that is kinaesthetic and embodied. Practical experience in developing the Reactive Colours project with children with ASD and teaching staff evidenced that when the technological environment was free from anxiety, children were able to demonstrate abilities that might otherwise have been missed. Providing even the most anxious of children the opportunity to become an active agent rather than a passive recipient of their learning has demonstrated unique capacities for play and engagement, which proved highly motivating for not only the children themselves, but also for their teachers, many of whom suggested ReactTicks was one of the applications they valued the most for the most severely autistic and low functioning children.

In the next phase of my research I will extend this approach to consider the wider implications of using mobile and networked technologies to promote creative self expression, synthesis and transfer, which could ultimately "help people with disabilities and special needs to overcome the additional barriers they face in communication and learning" (Becta 2003:3).

### Acknowledgements

On behalf of the Reactive Colours team, Alun Owen, Ben Norris and myself, I would like to thank staff and children from the Hollies School in Cardiff, Wales, UK for providing inspiration and overwhelming enthusiasm for this project. I would also like to thank my colleagues from the University of Birmingham WebAutism Course, Karen Guldberg, Geoff Fitzpatrick and Helen Joy, for their ideas and clarity in creating content for the ReactTicks Creativity Box. Finally I acknowledge the vision and support of NESTA for funding the Reactive Colours project.

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### Related Links

Becta <http://www.becta.org.uk/>  
 National Curriculum Online [http://www.nc.uk.net/use\\_ict.html](http://www.nc.uk.net/use_ict.html)  
 National Film Board of Canada <http://www.nfb.ca/index.php>  
 NESTA <http://www.nesta.org.uk/>  
 Reactive Colours <http://www.reactivecolours.org/>,  
<http://www.reactivecolours.org/gallery/main.php>,  
[http://www.reactickesglobal.co.uk/Tag\\_Learning](http://www.reactickesglobal.co.uk/Tag_Learning)  
<http://www.taglearning.com/productdetails/ReactTicks.html>

For information about IOCT forthcoming seminars, visit [www.ioct.dmu.ac.uk/events](http://www.ioct.dmu.ac.uk/events)

## The Expanded Instrument System (EIS): An Introduction and Brief History

### Pauline Oliveros

Composer - Performer; Founder of Deep Listening  
 Distinguished Research Professor of Music  
 at Rensselaer Polytechnic Institute, New York and  
 Darius Milhaud Composer in Residence  
 at Mills College, Oakland, US

The Expanded Instrument System (EIS) is an evolving electronic sound-processing environment. EIS is dedicated to providing improvising musicians individual performance control over a variety of parameters that can transform their acoustic input to the system during live performance. EIS has always been intended for acoustic instruments and voices even though electronic sound sources can also be used as well as pre-recorded sources. Until more recently digital signal processing worked well for electronic sound and less well for acoustic sounds. Acoustic sounds are generally far more complex than electronically generated sounds.

Performers each have their own setup that includes their own microphones, control devices, a computer with sound card and audio interface. The computer provides the digital signal processing that includes variable delays, ambiance and modulation, and translates and displays control information for this processing from midi controllers, foot pedals and switches. The musicians and their instruments are the sources of all the sounds, which they pick up with their microphones and subject to several kinds of pitch, time and spatial ambiance transformations and manipulations.

The Expanded Instrument System (EIS) has undergone continual development since 1965 - forty-two years - from tape delay with tape machines to computers. This is a long trajectory and history involving acoustic, analog and digital means. Software for the EIS designed and developed by Pauline Oliveros was programmed over the last twenty years by Panaiotis, David Gamper, Stephan Moore, Jonathan Marcus, Olivia Robinson, Jesse Stiles and Zevin Polzin.

The EIS began with awareness and use of the delay that could be heard between the record and playback heads on reel to reel tape machines that is now emulated and elaborated in MAXMSP1 software. The early development of EIS with reel-to-reel tape machines is described in my article *Tape Delay Techniques for Electronic Music Composers written in 1969*. The article describes and illustrates the configurations of multiple tape machines with the heads connected by stringing tape from the supply reel of one machine to the take up reel of another machine.

The premise of the EIS back in 1965 was to challenge myself as an improvising performer. I felt that I could handle more musical information than I was able to perform without the extension of electronic feedback. I began experimenting as I performed with delayed sound fed back to audiences and me from the outputs of tape machines to loud speakers. It was important to me that all the sound that I made be live rather than pre-recorded. This was because a much more nuanced performance could be realized if none of the sources were pre-recorded.

I noticed that the layering in time could change the timbre of the original acoustic sound input. I enjoyed the sensations of my acoustic sounds transforming before my ears as the sounds came back to me. I learned that timing was important in introducing new input and that I could disguise the entry points depending on timing and attack so that richly changing timbres could emerge from the delays.

Through the years I understood the Expanded Instrument System to mean "time machine" - what is expanded is temporal - present/past/future is occurring simultaneously with transformations. What I play in the present comes back in the future while I am still playing, is transformed and becomes a part of the past. This situation keeps you busy listening.

This notion of a time machine is not unlike canonical forms such as the inventions and fugues of J.S. Bach and the repetitions of motives and sequences in the classical forms of Haydn, Mozart and Beethoven. Fascination with echo has always inspired composers from the depths of the myth of Echo and Narcissus to the 20th century when popular musicians and producers began realizing the expressive potential of echo

and reverberation. Many of the songs and sound tracks wonderfully described in *Echo and Reverb in Popular Music: Fabricating Space in Popular Music Recording 1900 to 1960* by Peter Doyle influenced me directly. I was particularly impressed by songs like *Riders in the Sky* sung by Vaughn Monroe, *Steel Guitar Rag* by Bob Wills and the Texas Playboys, *How High the Moon* by Les Paul and Mary Ford, *Juke* by Little Walter and many other selections that I heard on the radio and juke box as a teenager. It was the sound of the spaces differentiated by echo and reverberation within the songs that captured me.

Canons that are produced by the EIS can be disguised by the modulations that cause variations in the returns of sound input and also by the variety of spaces created by the multiple and varying delay times. These canons can be but are not necessarily pitch canons - they can be time and timbre canons. The EIS is both a time and space machine. The EIS imperative (and improvisation imperative) is to listen and respond: spatial relationships and progressions are as important as the traditional parameters of music (melody, harmony, rhythm, timbre).

Timbre particularly is affected by space. I discuss this effect in my article *Acoustic and Virtual Space as a Dynamic Parameter of Music 1995*: *"Virtual acoustics - a perceptual phenomenon - is created with electronic processing within an actual physical space. Simulated walls or reflective surfaces may cause a listener to perceive differences in room size and the tone quality of a musical instrument"*.

These virtual acoustics are also part of the expansion of EIS. Virtual acoustics gives the improvising performer new possibilities.

*"With the advent of signal processors and sophisticated sound systems, it is possible to tamper with the container of music in imaginative ways. The walls of a virtual acoustic space created electronically can expand or contract, assume new angles or virtual surfaces. The resulting resonances and reflections changing continuously during the course of a performance create spatial progressions much as one would create chord progressions or timbre transformations (changing the tone quality of an instrument while performing a single pitch). The audience and performers can experience sensations of moving in space as well as sounds moving through space. They can also experience the relationship of moving in space in relation to sounds moving in the same space and while the space itself is changing. Such audio illusions or virtual acoustics can function as a new parameter of music much as timbre became new in Klangfarben Melodie (tone color melody) - where the notes of a melody are distributed to different instruments successively as in the music of Arnold Schönberg who coined the term and Anton Webern. (See Five Orchestral Pieces opus 16 (1909 revised 1949) - Schönberg and Five Pieces for Orchestra opus 10 (1913) Webern)."*<sup>54</sup>

The EIS is fun! Acoustic input from an instrument or voice now can be processed with up to 40 variable delays, modulated with fluctuating waveforms, layered and spatialized. Sounds may be diffused in four, six or eight channels. More outputs could be programmed for sixteen, thirty-two, sixty-four and beyond. The current version programmed in MAX/MSP undergoes continual revision due to new performer demands and is a long way from the limited tape delay system of the beginnings of EIS. Time delays range from mille seconds to one minute or more depending on CPU power.

The EIS though is never finished there is always more to explore. Even though the idea derived from echo is very simple the applications of digital signal processing and routing result in endless variations and possibilities. The current revision of the patch also includes some intelligent controls for the innumerable parameters involved. These controllers can learn from experience. The controls can be set to run from a chaos generator or from a random event generator as well. The result is like having several partners turning knobs, faders and tripping switches that could not be affected by a single performer. There is a need for a smart meta controller that understands from experience how to direct all of the sub controllers and switches with intelligent guesses.

The EIS consists of modules that can be configured in the interface window from one to all in any way that the performer desires. Modules can be switched on with the window launcher and dragged to any position. The current list of modules includes the following:

- Window launcher
- Performance clock
- Master volume control



- Matrix Mixer
- Matrix
- Control Mapping Interface
- Performance parameters
- Looper (1-4)
- Delays (1-2) include modulation functions and 20 delays each.
- Reverb (1-2)
- VBAP (1-2) includes geometric patterns

In Figure 1 a selected configuration of EIS modules including looper 1, delay 1, matrix mixer, Lexicon 1, main volume, performance clock, reverb, VBAP and window launcher is shown. Other modules could be selected, moved around in the window or removed as desired.

Figure 1



Figure 2 shows the EIS Window Launcher: Each module of EIS may be opened separately or together. Module configurations may be saved by the patcher in MAX and reopened later.

Figure 2



Figure 3 is the Matrix Mixer: Any input can be connected to any output. Matrix configurations may be stored and recalled as presets. Presets can be recalled in performance or removed. The matrix window can be cleared at any time.

Figure 3



Figure 4 represents the EIS Matrix: A configuration of the open matrix shows analog inputs 1 and 2 going to loopers 1 and 2. loopers 1 and 2 going to Lexicons 1 and 2, Lexicons 1 and 2 going to delays 1 and 2, delays 1 and 2 going to reverbs 1 and 2 and reverbs 1 and 2 going to vbap 1 and 2.

Figure 4

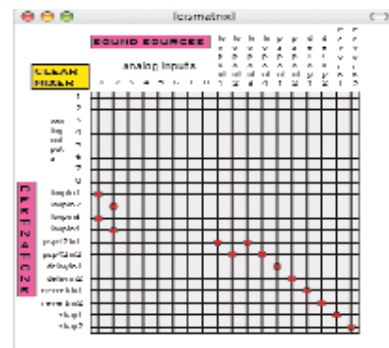


Figure 5 is the Control Mapping Interface: Midi controllers may be mapped to any modules. Upon launching EIS detects any midi controllers that are connected to the audio interface as well as users connected through the Ethernet connection. Midi mapping also may be passed to another performer on a different system through the IP Ethernet connection. A remote performer on the local network or interactively between performers may vary the amount of control of another system module.

Figure 5

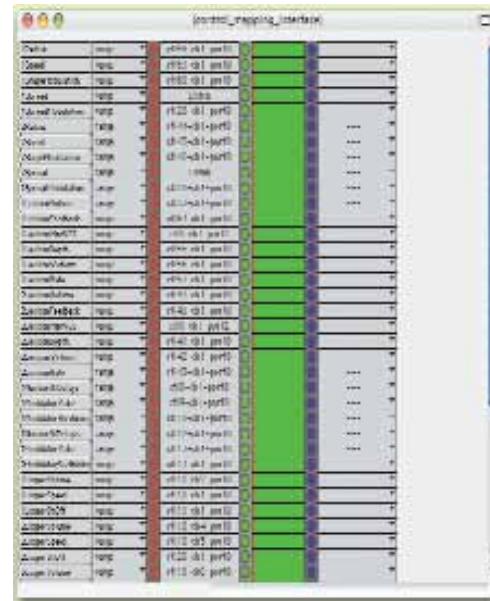


Figure 6 is the Lexicon PSP42 VST: Simulation of the original Lexicon PCM42<sup>®</sup> digital delay processor used from 1983 in earlier versions of EIS. Selected controllable functions used are volume, feedback, delay time (0-10"), manual VCO, depth, waveform and rate. The manual VCO and any of the PSP42 functions can be mapped to a midi foot controller or any midi controller.

Figure 6



Figure 7 illustrates Delays (1 of 2): There are up to 20 variable time delays on each module that can be modulated with a variety of waveforms. The list includes sweep, sine, triangle etc, as can be seen under modulator type on the module. Waveform at the bottom of the list is a special modulator that allows the performer to draw waveforms. The depth of modulation can be varied. Modulation type can be randomized or switched off entirely. The degree of shift in randomization can be varied. All controls can be varied manually, with a random event generator, chaos generator or through learned behaviour. Although midi mapping to external controllers could be an option it is obvious that no performer could manage all the controllers needed during performance. Thus algorithmic control is the best option for these delay modules.

Figure 7



Figure 8 is the Looper: (1 of 4) analog input can be recorded or input from any other module including other loopers. The speed control allows the input to increase pitch with + values and play backward with - values. Both speed and volume can be varied manually, or algorithmically with a random event generator, chaos generator or with learned behaviour.

Figure 8

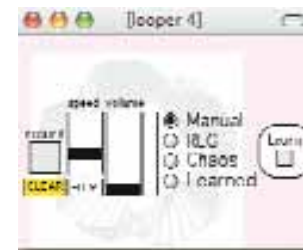


Figure 9 shows the Reverb: any module or analog input may be mapped to either reverb 1 or 2 or both in parallel or series. All four Monoverb7 variables - room size, damping, and wet level and dry level - may be controlled manually or with a random event generator (REG), chaos generator or learned behaviour. Monoverb works well within limited CPU power. With sufficient CPU power Altverb8 may be used for richer reverberation choices using impulse/responses as another option.

Figure 9



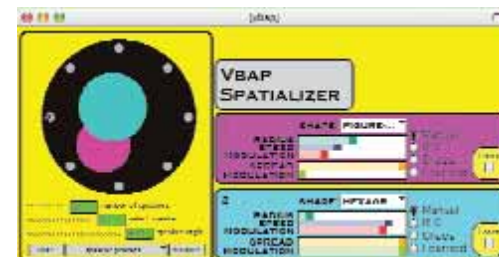
Figure 10 is the VBAP: Vector Based Amplitude Panning uses objects developed by Ville Pulkki<sup>®</sup>. Configuration of speakers is accomplished on the left side of the VBAP module. The functions available are: *number of speakers, select speakers, speaker angle, store, presets and remove*. The large circle containing smaller blue and pink moving circles indicates the positions of the speakers and the paths of the two sound sources in the speaker field.

On the right side of the VBAP Spatializer module shapes provides patterns of movement through the sound field. Available shapes are listed in the pull down menu and include ten geometric patterns plus a recordable pattern that can be drawn by the performer, stored and recalled.

Five variable functions can affect the path of the sound sources and amplitude. These functions are radius, speed, modulation (modulation affects Radius and speed), spread, modulation (modulation affects the size of the sound source in the speaker field). The functions can be controlled manually or by the REG, Chaos or Learn controllers.

The default VBAP configuration uses eight speakers evenly spaced in a circle. Speakers can be arranged in any circular position. Minimum speakers are four.

Figure 10



EIS runs on OS X 10.2 or higher using 1.25 GHz processor or faster with 512 MB RAM or more. EIS is available as a stand-alone application or as a patch for MAX/MSP. The patch version of EIS requires MAX/MSP 4.5.3.

For more information see <http://www.deeplisting.org/site/EIS>. EIS is a project of the Deep Listening Institute Ltd.10

## Notes

- 1 MAX/MSP is a graphical environment for music, audio, and multimedia. See <http://www.cycling74.com/products/maxmsp> for details on the Cycling74 web site.
- 2 Oliveros P., Tape Delay Techniques for Electronic Music Composers in Software for People: Collected Writings 1963-1980, Smith Publications and Printed Editions, 1983.
- 3 Doyle, Peter, Echo and Reverb in Popular Music: Fabricating Space in Popular Music Recording 1900 to 1960, Wesleyan University Press, 2005
- 4 Oliveros, P., Virtual and Acoustic Space as a Dynamic Parameter of Music in The Roots of the Moment: Collected Writings 1980-1996, Droque Press, 1998)
- 5 Anton Webern. (See Five Orchestral Pieces opus 16 (1909 revised 1949) - Schönberg and Five Pieces for Orchestra opus 10 (1913) Webern.)
- 6 Lexicon PCM42 digital delay processor. Gary Hall designed and built the PCM42 for Lexicon. The performance parameters and excellent sound are what attracted me to the PCM42. Here is an article by Gary Hall on this device: [http://emusician.com/dsp/emusic\\_max\\_factor/](http://emusician.com/dsp/emusic_max_factor/)
- 7 Monoverb is an external object - a mono implementation of the Schroeder/Moore reverb model (mono version of freeverb-) see [http://maxobjects.com/?v=authors&id\\_auteur=39](http://maxobjects.com/?v=authors&id_auteur=39)
- 8 Altverb see <http://www.audioease.com/Pages/Altverb/AltverbMain.html> for complete details.
- 9 For in depth information on Ville Pulkki, VBAP and his articles on VBAP see <http://www.acoustics.hut.fi/research/cat/vbap/>
- 10 Deep Listening Institute, Ltd. see <http://www.deeplisting.org> for mission and detailed information about the organization.

## Discography: Recordings using EIS

- Pauline Oliveros-Accordion, Miya Masaoka-Koto, DL-CD, Deep Listening 2007
- Pea(ce) Soup, for dried peas, metal bowl and Expanded Instrument System, Liquid Architecture 2007
- Primordial Lift (1998) for Electric cello, cello/voice, violin, harmonium, accordion/EIS, sampler, low frequency oscillator DL-CD-33
- Deep Time Fritx Hauser, Deep Listening 2005
- Tara's Room, Two Meditations on Transition and Change, Pauline Oliveros, Deep Listening (2004)
- Recording Field, H, Interface Curtis Bahn and Dan Trueman with Pauline Oliveros, Tomie Hahn. Deep Listening DVD (2003)
- NO MO, Something Else & Bog Road (1966) - (Pogus 21023-2, 2001) Electronic Music
- Live in Atlanta: The Carrier Band - (Deep Listening, 2000) Andrew Deutsch-electronics, Peer Bode-vocoder, Pauline Oliveros-accordion/EIS and guest artist Dick Robinson-electronics.
- Carrier 1999 (Deep Listening) Recorded at Alfred University with Andrew Deutsch, Peer Bode and Pauline Oliveros
- Non Stop Flight 1998 (Music and Arts CD1030) Deep Listening Band, Recorded at Mills College Fall 1996 with Abel, Steinberg, Winant Trio, The Hub and 12 soloists.
- Ghostdance (Deep Listening1998) Pauline Oliveros-Accordion, Julie Lyon Rose-Voice and David Gamper-Djembe/ Expanded Instrument System
- In the Shadow of the Phoenix (Big Cat, London1997) a duo with multi-instrumentalist Randy Raine-Reusch included in Drift Works a four CD boxed set with three other artists.
- Pauline Oliveros: Beautiful Soop and Alien Bog (Pogus,1997) Vintage electronic music made with the Buchla 100 series synthesizer in 1967 at the Mills Tape Music centre (now the centre for Contemporary Music).
- Pauline Oliveros: Electronic Works I of IV, Big Mother is Watching You and Bye Bye Butterfly (Paradigm, 1997)
- Suspended Music (Periplum1997). Includes Epigraphs in the Time of Aids with Deep Listening Band and Ellen Fullman's Long String Instrument. Recorded at the Candy Factory in Austin TX.
- Tosca Salad 1995 (Deep Listening, DL 3 CD 1995)
- A sampler of rehearsals and performances 1992-95 of the Deep Listening Band in a variety of settings and using the Expanded Instrument System (EIS) EIS enables processing of acoustic sounds and the possibility of changing the apparent acoustics of the performance space.
- Deep Listening Sanctuary 1995 (Mode 42 1995)
- A fourth recording by the Deep Listening Band with Pauline Oliveros, David Gamper and Stuart Dempster. Recorded by Bob Bielecki in the acoustically beautiful





sanctuary of the Trinity United Methodist Church  
The Ready Made Boomerang (New Albion NAO44CD, 1989)  
Crone Music 1989 (Lovely Music Ltd, LCD 1903)  
Music created with accordion and Expanded Instrument System for the Mabou Mines production of Lear 1990  
Trogolodyte's Delight 1990 (Deep Listening)  
The Deep Listening Band (Pauline Oliveros, Stuart Dempster, Panaiotis) with guests Fritz Hauser and Julie Lyon Ballietto explore the sound properties of the Tarpaper Cave in Rosendale, NY in a special underground concert and recording. 1990  
CDCM Computer Music Series, Vol 7 (CRC 3047 Centaur)  
Includes Oliveros' Lion's Tale 1990  
Kimus #2 1988 (HatArt CD 0901) A HatArt CD Sampler  
The Roots of the Moment Short version  
The Roots of the Moment 1988 (hatArt CD 6009)  
Accordion in just intonation in an interactive electronic environment created by Peter Ward, 1988.

## Mobile, Pervasive and Locative Media Art and the Reinvention of Place

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"Locative media emerged over the last half decade as a response to the de-corporealized, screen-based experience of net art, claiming the world beyond either gallery or computer screen as its territory. Initially coined as a title for a workshop hosted by RIXC, an electronic art and media centre in Latvia during 2002, the term is derived from the "locative" noun case in the Latvian language, which indicates location and vaguely corresponds to the English prepositions "in", "on", "at" and "by"."

### Space and Place

Screen cultures to date have been dominated both by narrative and by its modes of framing. Dispersed modes of interaction raise a series of questions about emergent new media art forms, particularly in relation to an audience's changing modes of participation and reception. The convergence of mobile technologies and pervasive computing methods are creating a world where information-rich layers can be mapped directly onto urban topologies. This opens up a series of interrogations around changing concepts of space and place and new perceptions of urban space for a wide range of traditional disciplines from art and architecture to cultural studies. The blurring of the boundaries between physical and virtual demands a new theory-base to explain our changing concepts of the "real", and, with the growth of hybrid environments, the concomitant changes in sociability and communication patterns.

The nature of audience interaction is responding to a socio-cultural dynamic that, although yet far from being quantified, demonstrates a desire for a greater degree of 'participation', evidenced in popular broadcast television e.g. Big Brother and its interactive outlets and in the meteoric expansion of social networking on sites such as MySpace and Facebook. Such examples, however, fall far short of the requirements of serious art.

What therefore is the potential for the emergence new visual and auditory languages and strategies of narrative in the new paradigm of locative and pervasive media? Analysing and redefining the emergent visual and auditory languages required to enable the realisation of effective interactive narrative and art forms in urban and site-specific environments is a huge challenge. But only through such an understanding of the new and radical forms of experiment, can we attempt to map changes in sociability and communication patterns and new forms of collaboration.

How can this extension of interactive technology from fixed installation to real urban geographies radically alter the modes of audience participation and reception? If the physical space overlaps the space of diegesis, can this emergent space for art and performance create new perceptions of space and place in an audience? We appear to need a redefinition of the concept of physical space (including hybrid environments), since through such technologies a new perception of urban space is emerging which is not visual, but conceptual.

Much reflection on Locative media art has been premature, for as Drew Hemment observes

*"It is too early to offer a topology of locative media arts, however, or to tie the field down with strict definitions or borders. While artists such as Masaki Fujihata (JP), Teri Rueb (CN) and Stefan Schemat (DE) have been producing work in this area for many years, more widely there have been only a handful of fully realised locative art works, with many projects remaining in the beta-stage, if not still on the drawing board. We have not yet reached the point at which the technology disappears - all too often the tendency is to focus on the technology and tools rather than the art or content!"*<sup>2</sup>

The waters have been further muddled by the convenient way in which artist's projects have often aligned with the consumer research interests of the mobile phone companies, where yesterday's locative project becomes tomorrow's "killer app"

*"Mike Liebholt of the Institute for the Future (IFF) regards "geohackers, locative media artists, and psychogeographers" as key players in developing the "geospatial web," in where the web becomes tagged with geospatial information, a development that he sees as having "enormous unharvested business opportunities". and believes that this context-aware computing will emerge as the "third great wave of modern digital technology".*<sup>3</sup>

Locative artworks, based on digital mobile technologies are a relatively new phenomenon. Yet art practice based on site-specific works and nomadic strategies is not just old, but ancient. Locative Art, by its very nature, trespasses into the realm of Public Art, but by its interaction with the public, transforms our notions of site-specific and ambulant practices, defined over the last three decades by artists such as Richard Long, Hamish Fulton, Vito Acconci and Sophie Calle. The history of located and nomadic art is a very long one indeed- stretching back beyond Robert Smithson and Richard Long to Aboriginal Songlines and spatialised religious rituals. I pose here the question whether, by similarly rooting locative practice in profound cultural and psychological structures, locative work can gain greater artistic resonance. Respect for place and space has long gone from our social uses of location-based technologies and may only be reclaimed by artists.

While the tagging of urban space is a process enabled by the commercial concerns of big software players such as Microsoft and Google, it will probably only be when that process meets the next generation of GPS enabled mobiles that the really interesting art works will begin to emerge, possibly on individual issues of sustainable lifestyles, as in Katherine Moriwaki's Inside Outside pollution-sensing handbag.<sup>4</sup> Social uses of technology are always beyond prediction. Christian Nold, for example, has definitely found a new way to exploit the personal context of the technology with his emotion mapping and bio-sensing in relation to location.<sup>5</sup> I am sure such hybridity combined with the collective construction and augmentation of site-specific knowledge through wiki-like interfaces is an evolving future for locative art.

### Figure 1

GPS Tracking of referee's movements in a match (Jeff Knight, De Montfort University)



Which brings me to a further question relating to the art itself. Much of

what is named 'Locative Art' is not really art, but rather games-based work or spatial documentary or simply advanced toolsets that happen to use this technology (see Figure 1). I think the potential is there, but art has a different function to these uses and when it is truly present you can smell and see it from afar. This brings us back to my earlier question about the pleasures and modes of user experience and how we can distinguish these from other media art forms or genres of work.

In defining the pleasures of the medium, the *Mobile Bristol* project made an attempt to identify these through a seminar series in 2005 where, for example, it was discovered that the accidental overlapping of ambient environmental sound and augmented sound within a locative work created delicious ambiguity and extra resonance for an audience.<sup>6</sup> What is needed most I think is to understand both the social context of these new artworks and the pleasures of their reception and use. These are dependent on haptic and spatial senses such as proprioception (the mechanism involved in the self-regulation of posture and movement through stimuli originating in the receptors imbedded in the joints, tendons and muscles), which are little understood by artists.

### A Gendered form

The political and economic shape of society ultimately forms contemporary modes of narrative. The contradictory pressures of neo-liberal economics, which drive the growth of personalised and peer-to-peer media and the interpenetration of workspace and private space, also seem to offer a unique opportunity to break Mulvey's determinist "male" control of narrative vision, which dominated narrative in the 19th and 20th centuries and to promote a more de-centered and subtle mapping.<sup>7</sup>

Feminist critics have often raised alternative strategies to break the negatives of a culture of male "control". Not surprisingly, some interesting female locative practice explores precisely this area. Teri Rueb's *Drift*,<sup>8</sup> for example, tied a sound landscape to the movements of the tide on a north European beach. The installation covered a 2 km x 2 km region on the Wadden sea that is filled with areas of interactive sound. The piece creates a space of flows consisting of sounds and words that travel like particles on simulated air and water currents loosely based on oceanographic and meteorological data. The audience had either give itself up to the primal cycles of nature or risk terminal confusion and data loss.

### Performance or Game-play?

Mobile devices already appear performative in their nature, with public space interpenetrating our private concerns, so that any conversation has its willing or unwilling eavesdroppers. Add to this the potential for social interaction, crudely demonstrated by *Flashmobs* and in more sophisticated ways by mobile gaming you have a case of new technology creating adaptive social behaviours, which contain strong performative elements.

*"The mobile games industry has long been the poor relation of the PC and console markets, but a combination of new technology, services and investment is fuelling optimism that mainstream adoption is not too far off. Ask anyone to name a mobile phone game and the most common response will be Snake or Tetris. And while the classic Russian puzzler is the world's most played and downloaded mobile game it is not an accurate reflection of the industry!"*<sup>9</sup>

Far more demanding games are already being played using mobile technologies such as *Catchbob*<sup>10</sup> and Blast Theory's *Uncle Roy All Around You*, which combine Internet and mobile technologies, where the city and the Internet were regarded as related stages on which we play, regardless of the specific context. Steve Benford of Nottingham University now talks of "seamful" media where players have learnt to exploit GPS "shadows" (where tall buildings block satellite triangulation) to their own advantage during game play, describing how such unforeseen effects of the technology encouraged new kinds of movement through the city.<sup>11</sup>

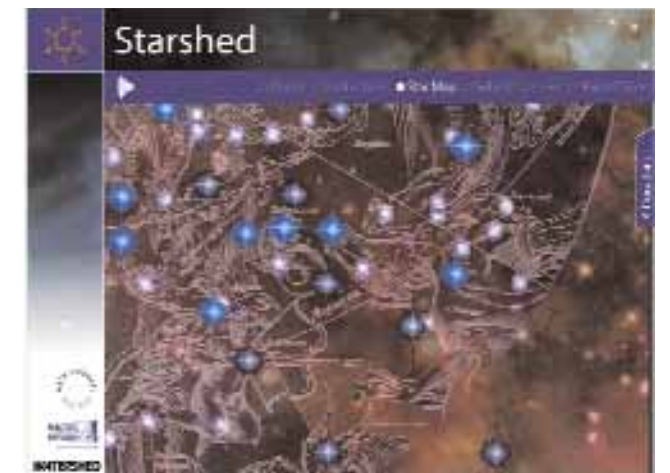
The failure of such works is often in terms of misapplied contextual practice: I once tested Valentina Niisi's *Media Portrait of the Liberties* in Dublin before the demise of MIT's Eurolab.<sup>12</sup> We had gone about a block when the local youths began stoning us. The technology was certainly impressive, but this new form of public art was alien even to the children of the collective contributors to the artwork. When participating in Blast Theory's *Uncle Roy All Around You*, I reflected on how the game's format had reduced the richness of the city to a few textual clues and a dangerous process of frantic searching, with users crossing roads with even less awareness than the average iPod listener.

### Spatial Annotation

Spatial annotation has emerged in the last three years as a major Internet phenomenon, particularly with the growth of Google Maps and social photosharing sites such as Flickr. In spatial annotation projects like *Yellow Arrow*<sup>13</sup> and *Neighbornode*<sup>14</sup> and in my own *Starshed*<sup>15</sup> for Electric Pavilion (see Figure 2), cities are increasingly being treated as surfaces on which individuals can inscribe annotation, and which will ultimately become repositories of collective memory. Such story-telling projects allow for new social and cultural readings of space, allowing private narratives to become public and subject to reinterpretation.

### Figure 2

Starshed (Martin Rieser/SOF)



Satnav systems tend to reduce our world to roads between A and B. The specific tagging potential of the locative can certainly overlay this reductive idea of space with all the richness of personal experience, but that depends on the framework provided and the context set by the artist, and in many projects this is so loosely drawn that we simply achieve a kind of public palimpsest.

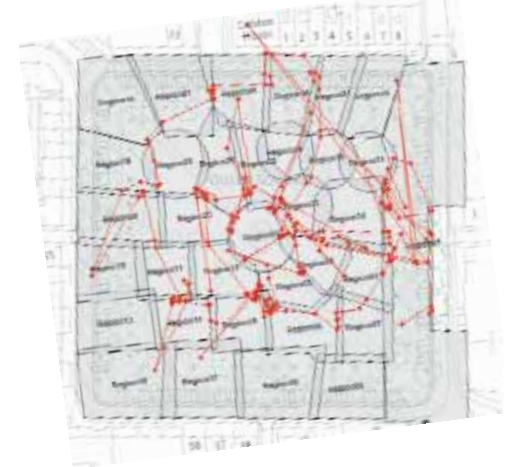
In their project *34n 118w*, Jeffrey Knowlton, Naomi Spellman, and Jeremy Hight had users take Tablet PCs with Global Positioning Devices and headphones onto a former railway yard in downtown Los Angeles. As participants walked around the site, they could hear fictional statements recounting the history of the place. To quote Hight:

*"The story world becomes one of juxtaposition, of overlap, of layers appearing and falling away. Place becomes a multi-tiered and malleable concept!"*<sup>16</sup>

There are other contemporary narratives resonant with the reinforcement of site and story. *Riot1831!* from Mobile Bristol depicted the Bristol Riots of 1831.<sup>17</sup> This first GPS-enabled locative drama was an immersive and powerful experience, engaging with the immediate spaces of history, mapped onto a Georgian square where the original events took place (see Figures 3 and 4).

### Figure 3

Riot!: User tracks in Queens Square showing audio zones







**Figure 4**  
Riot! Users in Square



At first sight it seems contradictory that such engaging locative works tend to deal with an historical past rather than the lived present. After all Paul Virilio identified new media as promoting the change from considered diegesis to continuous and automatic present, the user creating the narratives both as subject and object; the visual subject becoming transferred to a technical effect, which forms a sort of ‘pan-cinema’, turning our most ordinary acts into movie action. However where these locative works succeed, they seem to overlap the user’s enactment of a continuous present with the user’s immediate perception of a contiguous past.

The ever increasing technologising and enclosure of urban and public spaces is a phenomenon associated with the growth of ‘Herzian’ Space and what Mark Augé<sup>18</sup> has termed the growth of “no place” (The anonymous motorway or mall). Stephen Graham points to how “places [are] becoming increasingly constructed through consumer decisions which, in turn, are influenced through the...surveillance, and sorting, of cities.”<sup>19</sup>

Such cities, increasingly “sorted” through software and networking, highlight a related political question about the embedding of previous relations of power, class and ownership in the new infrastructures and whether this perpetuates ancient divisions or raises further questions related to the potential for community and individual empowerment.

### Mapping as Critique

Apart from the arguments that the technology is intrusive and very commercial and is being “sold” to us via arts projects, there are those about the role of Situationist ideology in locative media (something about which I am personally deeply sceptical, mainly because so few artworks succeed in the ‘Detournment’ of the original movement). The GPS mapping practice of modern psychogeographers (see <http://www.gpsdrawing.com> and <http://socialfiction.org>) are seemingly related to the writings of Guy Debord and his practice of the ‘Dérive’<sup>20</sup> but in reality seldom appear to achieve anything identifiably subversive.

To quote one cultural critic, “Locative media is: Psychogeography without the critique. Algorithmic psychogeography, the term used by <http://socialfiction.org> to describe their rule-based derives through the city, is not just a development, but actually a fundamental reversal of the critical use of this Situationist tool!”<sup>21</sup>

The ‘Dérive’ or ‘drift’ was a method for subversion, of remapping the world with ‘uncontrolled’ clarity, for identifying the secret flows of money and power below the surface of the city. However, one strategy Debord does cite: “the introduction of alterations such as more or less arbitrarily transposing maps of two different regions”, has been successfully adapted in several locative works. Jen Southern and Jen Hamilton in *Distance Made Good*,<sup>22</sup> used parallel mirrored journeys on two continents; in *Shadows from Another Place*<sup>23</sup> Paula Levine creates a hybrid space between Baghdad and San Francisco composed of the superimposition of their city centres. A mapping of the initial US attack on Baghdad is

superimposed upon downtown San Francisco. The longitude and latitude of each bombsite is marked in San Francisco using a GPS device. C5 Corporation in *The Other Path*<sup>24</sup> set out on a month long Great Wall trek, starting in the northwest desert of China and following the Wall eastward to where it runs to the edge of the Yellow Sea. GPS data collected during this trek was used to develop a pattern matching search procedure for locating the most similar data model in the most similar terrain in California.

Mark Tuters has perceptively identified how such annotation and tracing fits into the legacy of Situationism, which Locative Media has claimed as a philosophical base from its inception.

*“Roughly, these two types of locative media, Annotative and Tracing, correspond to two archetypal poles winding their way through late 20th century art, critical art and phenomenology, perhaps otherwise figured as the twin Situationist practices of detournment and the derive.”<sup>25</sup>*

Situationism in Locative media resists easy definition, but may best be represented says Tuters, by one of Deleuze and Guattari’s maps which distinguish between annotation and tracing:

*“The map is open, connectable in all its dimensions, and capable of being dismantled: it is reversible, and susceptible to constant modification. It can be torn, reversed, adapted to montages of every kind, taken in hand by an individual, a group or a social formation. It can be drawn on a wall, conceived of as a work of art, constructed as a political action or as a meditation...Contrary to a tracing, which always returns to the ‘same’, a map has multiple entrances”<sup>26</sup>*

Blast Theory, a locative media group composed of several London-based avant-garde theatre artists, has gained renown for projects such as *Can You See Me Now* (2001), *Uncle Roy All Around You* (2003), and *I Like Frank* (2004), in which they used location-aware mobile mapping devices to coordinate interactions of audience and performers in both real and virtual space. *Uncle Roy All Around You* is one of the most lauded recent locative works, yet it appears an uneasy mix of performance and game, its full narrative only accessible to those who successfully complete their quest. The real and virtual sit in an uncomfortable relationship with the environment, which is only valued as a source of directional clues – and any casual bystander remains largely mystified and excluded. The charge levelled at Blast Theory at a conference was that of complacently and uncritically adapting new practice for the games industry, thus unwittingly acting as fashionable agents for intrusive and suspect technologies, for the flip side of ubiquitous communication and augmented location is the ability to track the audience. So, a whiff of the totalitarian always haunts the liberating potential of the technologies. Matt Adams has rebutted this critique in interview, pointing to the collaborative co-dependency explored by the work.<sup>27</sup>

Their performances and installations have been supported through corporate sponsorship, public arts funding, and through a six-year collaboration with the Mixed Reality Laboratory at the University of Nottingham. The group’s own web site claims “Blast Theory has a history of working with corporate clients to deliver innovative marketing strategies” thereby creating “commercial projects that draw global audiences to compelling, high adrenaline interactive experiences. The team of artists and scientists has worked with blue chip clients in the television, apparel and telecoms sectors to launch products, build profile, inspire staff and engage customers”.

An early locative project, which epitomized its emergent qualities, was MILK, winner of a Golden Nica at Ars Electronica. With MILK, the artists, Esther Polak and Leva Auzina, used GPS to trace routes to create a form of landscape art for a network society. MILK was based in part on a project by Polak and the Waag Society, *Real Time Amsterdam*, in which GPS transponders mapped cyclists in Amsterdam on their traffic routes by the aggregation of their travel measured over a period of weeks. MILK suggested a god-like vision of locative technologies that allowed the tracking of freighted foodstuffs. In this case with heavy irony, since the dairy-rich Netherlands import their milk from Latvia making visible the contradictions and excess of a networked society.

The increasing importance of maps in defining space within these projects should not blind us to the fact that mapping is not a neutral process, but always has been a highly selective and subjective one, in which can be embedded various (invisible) ideological assumptions. Many GPS mapping projects tend to forget this and even revel in the act of remapping without context.

Media artist, Coco Fusco, also launched a headlong attack on new media practices associated with networks and mapping, declaring: *“It is as if more than four decades of postmodern critique of the Cartesian subject had suddenly evaporated...In the name of a politics of global connectedness, artists and activists too often substitute an abstract ‘connectedness’ for any real engagement with people in other places or even in their own locale.”<sup>28</sup>*

### Exploration of Tangible Objects

We are entering into a society based on ubiquitous networked objects or Bruce Sterling’s *Spimes*<sup>29</sup> (a blend of space and times, they are precisely located in space and time, they have histories, they are recorded, tracked, inventoried, and always associated with a story). Soon, objects will be the most frequent users of the Internet, as fridge talks to oven and RFID tags note the progress of stock to central computers. But what the International Telecommunications Union has termed the “Internet of Things” means far more than just tracked objects.

The pervasive and context aware object will partner a far more physical engagement with mobile devices. The Wii has fomented a revolution in indoor gaming. Devices such as the that of the US firm Gesturetek, which has developed software to use a phone’s camera to interpret how the phone is being moved. Translating gestures into action will promote the use of body actions in street level mobile gaming but as John Vincent, president and founder of the firm, said “Being able to do natural movements, not just hand but also full body movement is the way forward.”<sup>30</sup>

The technology is embedded in phones released by NTT Docomo in Japan and allows gamers to move the phone, forward and backward, shake it, and roll the device to control action on the screen.

### Surveillance and Sousveillance<sup>31</sup>

In a C-Theory (online publication) article entitled ‘Operational Media’,<sup>32</sup> Jordan Crandall spoke of the “resurgence of temporal and locational specificity witnessed in new surveillance and location-aware navigational technologies” and Stephen Graham has warned of the invisibility of such tools and the embedding of discriminatory and selective process in such things as network server logic. Steve Mann caught on to this process very early in 1998 and labelled its subversion as “Souveillance” or ‘Surveilling the Surveillers’. Specifically he refers to Reflectionism as being especially related to “detournment”: the tactic of appropriating tools of social controllers and resituating these tools in a disorienting manner.

Fears of surveillance are undoubtedly real and relate to the imperative of the State in an age of counter-terrorism, to quote Manovitch “to make the map equal the territory”. Of course this technology is a double-edged sword, but then it is also made democratic by its distributive nature and is now in many hands. Artists who have questioned the vulnerability of the individual to tracking include Drew Hemment, through his *Loca* project<sup>33</sup>, and Jonah Brucker Cohen, with his *WiFi Hog*<sup>34</sup>, have challenged the enclosure of *Hertzian* space.

In the face of new enclosures of public electronic space, through surveillance and border control, biometrics and consumer tracking technologies, as Crandell puts it:

*The challenge is not only to endeavor to understand this operational construct, but to understand the forms of opposition to it that are emerging in the globalized world. For the operational is only one “window” onto reality. There are other orientations that counter it, and for which, by its very nature, it is unable to account. It is powerless to envision terms of engagement that do not operate according to its logics. It can only assign them to the realm of the barbaric or irrational: that which lies outside of its license on reason.”<sup>35</sup>*

The compromised publics can choose to respond through collective action, violence or the through the “reflective” intelligence of these new forms of media art.

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About the Contributors to this Issue

**Claudia Eckert** is a Senior Research Associate, Engineering Design Centre, Cambridge University, UK. She joined the Engineering Design Centre in January 1999 as a Research Associate on the Signposting Project, concentrating on knowledge acquisition and the use of design guidelines. Her previous work concentrated on intelligent support systems for knitwear design, beginning with a simple prototype for her MSc thesis. In her PhD thesis, entitled "Intelligent Support for Knitwear Design", she looked at how automatic design can overcome communication difficulties in multi-disciplinary design teams. The work included a large ethnographic study of the knitwear industry in Britain, Germany and Italy, which produced a detailed design process model and an analysis of the causes of communication problems within design teams. From 1996 to 1998, she initiated and conducted an ESRC funded research project entitled Mechanisms of Inspiration in Novel Design, studying how sources of inspiration are used in knitwear design. In 1998 the Open University funded her project to develop a prototype garment shape design system.

**Wendy Keay-Bright** is a Reader on Inclusive Design at Cardiff School of Art and Design, University of Wales Cardiff, UK. A graduate of Graphic Design and Animation, Wendy began her career at Siriol Animation on the popular children's TV series, SuperTed, before becoming a freelance animation producer. Clients included BBC One, HTV West and S4C. Her teaching career has developed alongside animation and new media production, and has provided challenge and energy. Her influences are film-makers Len Lye, Norman McClaren and Oskar Flischinger and digital artists John Maeda and Scott Snibbe; it is their use of technology as a medium for sophisticated, time-based experiences that reflect personal expression and performance that has provided inspiration for Wendy's work.

**Bruce Mason** is a Post-Doctoral Research Fellow at the Institute of Creative Technologies, De Montfort University, UK. He is a specialist in innovative methods for social research, and has worked on projects investigating new media, online culture and ethnography. He is the co-author of *Qualitative Research* and *Hypermedia* (2005). [http://www.hum.dmu.ac.uk/blogs/part/2006/05/bruce\\_mason.htm](http://www.hum.dmu.ac.uk/blogs/part/2006/05/bruce_mason.htm)

**Pauline Oliveros'** life as a composer, performer and humanitarian is about opening her own and others' sensibilities it the many facets of sound. Since the 1960's she has influenced American Music profoundly through her work with improvisation, meditation, electronic music, myth and ritual. Many credit her with being the founder of present day meditative music. All of Oliveros' work emphasizes musicianship, attention strategies, and improvisational skills. She has been celebrated worldwide. During the 1960's John Rockwell named her work *Bye Bye Butterfly* as one of the most significant of that decade. In the 70's she represented the US at the World's Fair in Osaka, Japan; during the 80's she was honored with a retrospective at the John F. Kennedy centre for the Performing Arts in Washington DC: the 1990's began with a letter of distinction from the American Music centre presented at Lincoln centre in New York: In 2000 the 50th anniversary of her work was celebrated with the commissioning and performance of her Lunar Opera: Deep Listening For\_tunes. Oliveros work is available on numerous recordings produced by companies internationally. Sounding the Margins (as it was) – a forty year retrospective will be released soon in a six CD boxed set from Deep Listening..

*"Through Pauline Oliveros and Deep Listening I finally know what harmony is....It's about the pleasure of making music."* John Cage 1989

**Martin Rieser** is Professor of Digital Creativity in the Institute of Creative Technologies and the Faculty of Art and Design, De Montfort University, Leicester, UK. He is a media artist and theorist working in a range of media from the Internet to Locative Media and Interactive Installation. His work is transdisciplinary and is particularly concerned with the combination of interactive poetry, sound, narrative and performance in still and moving image. He has exhibited internationally in Europe, Australia, America and Japan. His books include *New Screen Media* (BFI/ZKM, 2002) and *The Mobile Audience* (Rodopi, 2008). His recent research includes an Arts and Humanities Research Board funded project Hosts shown in Bath Abbey in 2006 and Roamedia, 2007, part of a Fellowship at La Trobe University, Melbourne.

**Howard Rheingold** is Visiting Professor to the Institute of Creative Technologies, De Montfort University, Leicester, UK; Lecturer, University of California, Berkeley, and Visiting Associate Professor, Stanford University, US. His lifelong fascination with technology led to his writing *Tools for Thought* in 1985, a history of the people behind the personal computer. Around that time he first logged on to The WELL, an influential early online community. He explored the experience in his seminal book, *The Virtual Community*. In 1991, Rheingold wrote *Virtual Reality: Exploring the Brave New Technologies of Artificial Experience and Interactive Worlds from Cyberspace to Teledildonics*. After a stint editing the *Whole Earth Review*, Rheingold served as editor in chief of the Millennium Whole Earth Catalog. Shortly thereafter, he was hired on as founding executive editor of *HotWired*, one of the first commercial content web sites published in 1994 by *Wired* magazine. Rheingold left *HotWired* and soon founded Electric Minds in 1996 to chronicle and promote the growth of community online. In 2002, Rheingold published *Smart Mobs*, exploring the potential for technology to augment collective intelligence. Shortly thereafter, in conjunction with the Institute for the Future, Rheingold launched an effort to develop a broad-based literacy of cooperation. As of 2008, Rheingold was teaching courses at University of California Berkeley and Stanford University.

**Sue Thomas** is Professor of New Media in the Institute of Creative Technologies and the Faculty of Humanities at De Montfort University, Leicester, UK. Her most recent book is the non-fiction travelogue of cyberspace 'Hello World: travels in virtuality' (2004). Other publications include the novels 'Correspondence' (short-listed for the Arthur C. Clarke Award for Best Science Fiction Novel 1992) and 'Water' (1994); an edited anthology 'Wild Women: Contemporary Short Stories By Women Celebrating Women' (1994), and 'Creative Writing: A Handbook For Workshop Leaders' (1995). She has published extensively in both print and online, and has initiated numerous online writing projects including The Noon Quilt, now an iconic image of the early days of the web. She founded the trAce Online Writing Centre in 1995 where she was Artistic Director until going to De Montfort in January 2005. She is Programme Leader of the Online MA in Creative Writing and New Media, which she teaches with Kate Pullinger, and leads the Production and Research in Transliteracy group (PART). Her research interests include transliteracy, collaborative media, and psychogeography. She is currently writing *The Wild Surmise*, a study of the relationships between cyberspace and the natural world. <http://suethomas.net/>.

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